

**EXHIBIT B**

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF ILLINOIS  
EASTERN DIVISION

ADRIAN ARRINGTON, DEREK OWENS,  
ANGELICA PALACIOS, and KYLE  
SOLOMON, individually and on behalf of all  
others similarly situated,

Plaintiffs,

v.

NATIONAL COLLEGIATE ATHLETIC  
ASSOCIATION,

Defendant.

Case No. 11-cv-06356

Judge John Z. Lee

Magistrate Judge Brown

**JURY DEMAND**

**REPORT OF ROBERT C. CANTU, M.A., M.D., F.A.C.S., F.A.C.S.M.**

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## I. QUALIFICATIONS

1. I am a physician licensed by the State of Massachusetts to practice medicine. I have been practicing medicine in Massachusetts since 1964 and have practiced in the specialty of Neurosurgery now for over 40 years. I have been Chief of the Neurosurgery Service at the Emerson Hospital in suburban Boston since 1968. I have acquired over the last 30 years particular expertise in sports related athletic cervical spine and head injuries from the following activities.

2. I have authored over 375 publications in the form of book chapters, refereed peer reviewed articles, books, abstracts and free communications as well as educational videos. Many of those publications have been specifically on the topic of athletic head injuries, epidemiology, diagnosis, treatment, rehabilitation, and prevention.

3. Over the last 30 years I have given hundreds of lectures and spoken and participated in hundreds of scientific meetings devoted to athletic injuries including head injuries.

4. I am currently an Adjunct Professor of Exercise and Sports Science at the University of North Carolina, Chapel Hill, North Carolina.

5. For nearly two decades, I have served as the Medical Director of the National Center for Catastrophic Sports Injury Research, an ongoing registry instituted in 1982 for data collection and analysis of predominantly head and cervical spine injuries.

6. I am currently Co-Director of the Neurological Sports Injury Center at Brigham and Women's Hospital in Boston, MA.

7. I am a Clinical Professor of Neurology and Neurosurgery at Boston University School of Medicine, Boston, MA.

8. I am the Co-Director of the Center for The Study of Traumatic Encephalopathy (CSTE), Boston University Medical Center, Boston, MA.

9. Since 1994, I have served on the Board of Trustees of the National Operating Committee on Standards for Athletic Equipment (NOCsae) and the last eight years served as its Vice President. This organization is responsible for establishing standards for football helmets as well as other athletic equipment.

10. For many years, I have been involved with the American College of Sports Medicine and have served on the Board of Trustees of that organization for more than 10 years and have also served as President of the American College of Sports Medicine from 1992 to 1993 and Treasurer from 1996 to 1999.

11. I was a member of the Advisory Committee for Injury Prevention, Centers for Disease Control, Atlanta, Georgia from 1998 to 2001.

12. I was a member of the Executive Committee, Joint Section of Trauma, Congress of Neurological Surgeons/American Association of Neurological Surgeons 2000-2002.

13. I have served as a consultant to many scholastic and professional athletes following severe cervical spine injuries regarding return to play issues and have also served as treating physician to a number of scholastic and professional athletes who have sustained head injuries.

14. I have on numerous occasions authored textbook chapters and articles discussing the causes epidemiology, biomechanics and pathophysiology of athletic head injuries.

15. Attached as Appendix A is my most recent Curriculum Vitae, which includes a list of my publications in the last ten years. Attached as Appendix B is a list of all cases in the last four years in which I testified as an expert at deposition or trial.

16. I am being paid \$800.00 per hour and have billed \$38,800 to date.

17. My opinions are based upon my specialized knowledge, skill, experience and education in the field of concussion management. My opinions are based on the data and articles described herein and I have applied reliable principles to reach my conclusions.

## **II. SCOPE OF OPINIONS**

18. Plaintiffs have requested that I provide answers to the following questions:

- a. What were consensus best practices for managing concussions in amateur sports during the period 2001 to the present?
- b. Did the NCAA adopt or follow, or require its member institutions to adopt or follow, consensus best practices for managing concussions in amateur sports? In particular I have been asked to consider this issue in the context of the NCAA's Constitution, Article 1, § 1.2 and Article 2, § 2.2, which provides in part that athletic programs "shall be designed to protect and enhance the physical and educational well-being of student athletes," and § 2.2.3, which provides that NCAA schools shall provide "a safe environment" for athletes. I also have assessed the NCAA's conduct considering that its duty of care should take into account that it has superior access to the dangers of concussion than the student athlete and has far greater bargaining power than the student athlete.

- c. Were the consensus best practices followed in the management of concussions suffered by the Plaintiffs while playing sports for NCAA member institutions?
- d. What is an appropriate medical monitoring program for student athletes in contact sports at NCAA member institutions?
- e. I have also been asked to assess whether the NCAA and its members met the consensus best practices for concussion management in response to the concussions suffered by the plaintiffs.

19. I was provided access to documents produced by the NCAA in this matter, as well as by Plaintiffs and third parties. In particular, the documents I considered in forming my opinion are listed on Appendix C.

### **III. SUMMARY OF OPINIONS**

20. Many laypersons associate concussion with football. Based upon my experience, as well as a review of relevant literature and the NCAA's documents, it is my opinion that concussions occur in a range of contact sports, including but not limited to men's and women's soccer, ice hockey, basketball, field hockey, lacrosse and wrestling. The NCAA for over a decade has been aware of the number of concussion incidents in those sports. Armed with this knowledge, to meet its promise to provide a competitive environment that is safe, the NCAA should have instituted and mandated concussion management rules but failed to do so.

21. Consensus about concussion management was reached in 2002 – and reinforced with each subsequent International Consensus Statement – that athletes suffering concussion symptoms should never be returned to play in the same game, and that coaches, players, trainers and physicians should follow a systematic return to play policy that includes systematic and graded return to exertion following injury, systematic reevaluation of symptoms following each exertional state, and a collective understanding that the patient is completely asymptomatic at rest, asymptomatic with exertion, and has intact neurocognitive performance prior to final clearance. Across all aspects of this standard protocol, it is clear that the NCAA failed to require (much less explain) appropriate concussion management practices.

22. Moreover, the 2004 National Athletic Trainers' Association ("NATA") Position Statement, another consensus document, provides that the "philosophy for managing sport-related concussion [should be set] before the start of the athletic season." "After deciding on an approach, the ATC-physician team should be consistent in its use regardless of the athlete, sport, or circumstances surrounding the injury." The NCAA's failure to implement an organized approach at assuring a safe return to competition for student athletes was contrary to the consensus best practices. The NCAA cannot find a safe haven in individualized medical issues

because appropriate return to play guidelines should be used consistently “regardless of the athlete, sport, or circumstances surrounding the injury.”

23. The 2004 NATA Position Statement requires that an athletic trainer or team physician should monitor an athlete with a concussion at 5-minute intervals from the time of the injury until the athlete's condition completely clears or the athlete is referred for further care. The 2004 NATA Position Statement also provides that an athletic trainer is supposed to refer the athlete to a physician on the day of the injury if the athlete experienced any of the following symptoms:

Day-of-injury referral	
1. Loss of consciousness on the field	14. Motor deficits subsequent to initial on-field assessment
2. Amnesia lasting longer than 15 min	15. Sensory deficits subsequent to initial on-field assessment
3. Deterioration of neurologic function*	16. Balance deficits subsequent to initial on-field assessment
4. Decreasing level of consciousness*	17. Cranial nerve deficits subsequent to initial on-field assessment
5. Decrease or irregularity in respirations*	18. Postconcussion symptoms that worsen
6. Decrease or irregularity in pulse*	19. Additional postconcussion symptoms as compared with those on the field
7. Increase in blood pressure	20. Athlete is still symptomatic at the end of the game (especially at high school level)
8. Unequal, dilated, or unreactive pupils*	
9. Cranial nerve deficits	
10. Any signs or symptoms of associated injuries, spine or skull fracture, or bleeding*	
11. Mental status changes: lethargy, difficulty maintaining arousal, confusion, or agitation*	
12. Seizure activity*	
13. Vomiting	
Delayed referral (after the day of injury)	
1. Any of the findings in the day-of-injury referral category	
2. Postconcussion symptoms worsen or do not improve over time	
3. Increase in the number of postconcussion symptoms reported	
4. Postconcussion symptoms begin to interfere with the athlete's daily activities (ie, sleep disturbances or cognitive difficulties)	

\*Requires that the athlete be transported immediately to the nearest emergency department.

24. Yet, the NCAA did not require that all teams have physicians or that referrals to physicians be made. The NCAA's failure to require physician involvement or to require that an athlete with concussion symptoms be seen by medical personnel experienced in concussion management was not in accordance with consensus best practices.

25. The International Consensus Statements provide that neuropsychological testing is one of the “cornerstones” of appropriate concussion management and contributes significantly to both understanding the injury and management of the individual.

26. Neuropsychological testing is especially critical in student-athletes because they may have a proclivity to minimize symptoms – whether because of pressure from a coach, to save their spot on the roster, or to protect their scholarship. Even when a student athlete states

that their symptoms are gone, neuropsychological testing will demonstrate whether their cognitive abilities have returned to pre-injury levels.

27. The NCAA's failure to require formal baseline testing was against consensus best practices. Without a formal baseline, it is very difficult for a physician to determine when a patient has recovered. And returning a student-athlete to play before they are fully recovered negligently puts them at risk for permanent brain injury. There is not a single good reason for not requiring all student-athletes to undergo baseline testing.

28. In my opinion, based upon review of documents, the NCAA has acknowledged internally that it has violated its duty of care. The NCAA knows, for example, that only 66% of schools performed baseline testing; yet the NCAA has not mandated baseline testing. The NCAA knows that less than 50% of schools require a concussed athlete to see a physician; yet the NCAA has not corrected this violation of the consensus best practices. Most alarming is the knowledge by the NCAA that half of its member institutions allow a student athlete to return to play in the same game. It is well settled in the scientific community that an athlete must never be returned to play on the same day after a concussion diagnosis.

29. In addition the NCAA and its members violated the consensus best practices and their duty of care to the named plaintiffs and the proposed class by:

- Until 2010, the NCAA failed to maintain or require, and the schools thus failed to maintain, a written protocol on concussion management
- The NCAA failed to provide student-athletes with catastrophic injury risk education
- The NCAA failed to implement appropriate baseline concussion testing
- The NCAA failed to require a stepwise return to play protocol
- The NCAA failed to require that student-athletes who suffered a concussion or displayed concussion symptoms be managed by medical personnel with specific expertise in concussion diagnosis, treatment, and management.
- The NCAA failed to require adequate documentation of concussion incidents

30. It is also my opinion that given the NCAA's failures, a medical monitoring program of current and former student athletes that have played contact sports is needed to determine if they are suffering from post-concussion syndrome or other cognitive impairments or mental disturbances associated with concussions or subconcussive hits.

31. This program would involve testing including a neurological assessment and a neurocognitive assessment.

32. All of the information gathered from these tests would be collectively evaluated by a physician skilled in the diagnosis, treatment and management of concussions and the results and/or diagnosis communicated to the student athlete.

33. Armed with the results and/or diagnosis, the student athlete will then be in a position to seek treatment appropriate to the diagnosis and be knowledgeable about the effects, if any, of concussions and subconcussive hits sustained at NCAA schools.

## **IV. BACKGROUND ON CONCUSSIONS**

### **A. What Is A Concussion?**

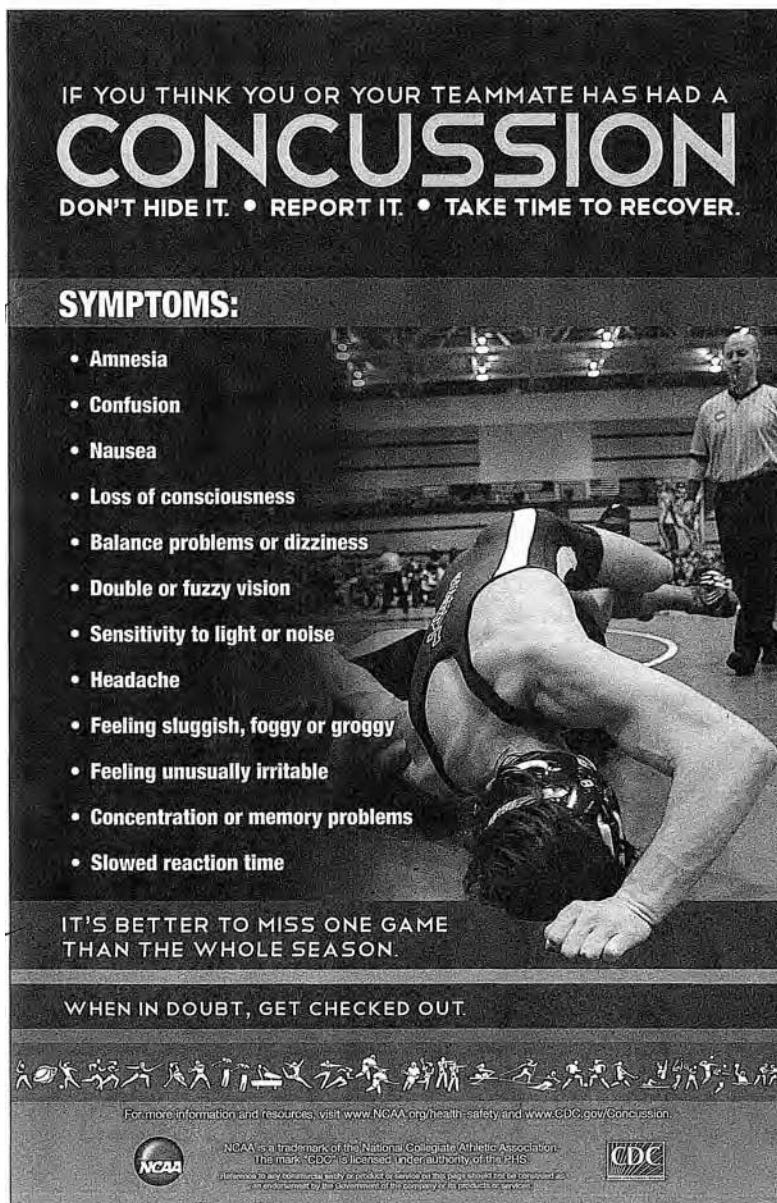
#### **1. Medical description**

34. Concussion or mild traumatic brain injury (mTBI) has been defined as “a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.” Although concussion most commonly occurs after a direct blow to the head, it can occur after a blow elsewhere that is transmitted to the head. Concussions can be defined by the clinical features, pathophysiological changes and/or biomechanical forces that occur, and these have been described in the literature. The neurochemical and neurometabolic changes that occur in concussive injury have been explained.

35. Most commonly, concussion is characterized by the rapid onset of cognitive impairment that is self-limited and spontaneously resolves. The acute symptoms of concussion, listed below, are felt in most instances to reflect a functional disturbance in cognitive function instead of structural abnormalities, which is why diagnostic tests such as magnetic resonance imaging (MRI) and computerized tomography (CT) scans are most often normal. These studies may have their role in assessing and evaluating the head-injured athlete whenever there is concern for the associated injuries of skull fracture, intracranial bleeding and seizures, when there is concern for structural abnormalities or when the symptoms of an athlete persist or deteriorate.

36. Concussion is associated with clinical scenarios that often clear spontaneously, and may or may not be associated with loss of consciousness (LOC).

37. The Center for Disease Control and NCAA identifies the following symptoms as being associated with concussions:



38. The CDC and NCAA fact sheet states as follows with respect to symptoms:



## 2. How concussions occur in sports

39. Concussions occur when linear and rotational accelerations are impacted to the brain from either direct impacts to the head or indirect impacts that whiplash the head. During the course of a college football season studies have shown athletes receiving more than 1,000 impacts greater than 10 G force which is slightly more than a fighter pilot receives doing maximal maneuvers. The majority of football related hits to the head exceed 20 G force.

40. While helmets, and to a lesser extent protective head gear, are effective in virtually eliminating skull fractures and dramatically reducing linear forces, they are ineffective in reducing the rotational forces that result in a concussion.

## 3. Metabolic changes

41. After concussion, there is a significant K<sup>+</sup> efflux from cells, owing to mechanical membrane disruption, axonal stretch, and opening of voltage-dependent K<sup>+</sup> channels. Nonspecific depolarization of neurons leads to release of the excitatory neurotransmitter glutamate, which compounds the K<sup>+</sup> flux by activating N-methyl-D-aspartate (NMDA) and D-amino-3-hydroxy-5-methyl-4-isoxazole-propionic acid (AMPA) receptors. In an attempt to restore the membrane potential, the Na<sup>+</sup>, K<sup>+</sup>-ATPase works overtime, consuming increasing amounts of ATP. To meet these elevated ATP requirements, there is a marked upregulation of

cellular glycolysis, which occurs within minutes after concussion. During this period of hyperglycolysis, there is a commensurate increase in lactate production.

42. In addition to K<sup>+</sup> efflux, NMDA receptor activation permits a rapid and sustained influx of Ca<sup>2+</sup>. Elevated intracellular Ca<sup>2+</sup> can be sequestered in mitochondria, eventually leading to dysfunction of oxidative metabolism and further increasing the cell's dependence on glycolysis-generated ATP. Calcium accumulation may also activate proteases that eventually lead to cell damage or death, and, in axons, excess Ca<sup>2+</sup> can lead to dysfunction and breakdown of neurofilaments and microtubules.

43. These ionic shifts and acute alterations in cellular energy metabolism occur in a posttraumatic setting where cerebral blood flow (CBF) is diminished, although not to ischemic levels. Rather, it is the mismatch between glucose delivery and glucose consumption that may predispose to secondary injury. CBF may remain depressed for several days after TBI, possibly limiting the ability of the brain to respond adequately to subsequent perturbations in energy demand.

44. After the initial period of profound post-injury ionic disturbance and resultant increase in glucose metabolism, the local cerebral metabolic rate for glucose decreases significantly below baseline, as does oxidative metabolism. Then gradually in most instances of concussion these metabolic changes revert to baseline over a 10 day period

#### **4. Rest is the hallmark of concussion therapy**

45. Physical and cognitive rest is the hallmark of initial concussion management. Either physical or cognitive exertion may greatly exacerbate concussion symptoms and retard recovery. This is a major problem for student athletes who need to perform in the classroom yet may be prevented from doing so by their concussion.

#### **B. Subconcussive Hits**

46. Subconcussive hits, or impacts that do not produce any clinical concussion symptoms, may also adversely affect cerebral function.<sup>1</sup> Evidence that subconcussive hits may adversely affect cerebral function has been reflected in documented changes in cerebral function (i.e., visual working memory declines), and altered dorsolateral prefrontal cortex activation as assessed by functional magnetic resonance imaging in high school football athletes in the absence of clinical signs of concussion.<sup>2</sup> In lay terms, the study on high school football players found that players who received normal football brain trauma and did not report any concussion symptoms still had functional MRI changes that mimicked concussed players.<sup>3</sup>

47. Similarly, in a study of college football players released in 2013, researchers found that the more hits to the head a player absorbed, the higher the blood levels of a particular brain protein, S100B, that is known to leak into the bloodstream after a head injury. Even though none

of the football players in the study suffered a concussion during the season, four of them showed signs of an autoimmune response, the presence of S100B antibodies in the players' blood. The players with the highest number of hits also showed abnormal diffusion tensor imaging findings on MRI DTI studies.

48. Some studies have suggested that concussions or a combination of concussions and sub-concussive head impacts may lead to conditions such as chronic traumatic encephalopathy,<sup>4</sup> mild cognitive impairment,<sup>5</sup> and/or depression.<sup>6</sup>

### C. Second Impact Syndrome

49. What Saunders and Harbaugh<sup>7</sup> called "the second-impact syndrome of catastrophic head injury" in 1984 was described by Schneider in 1973.<sup>8</sup> The syndrome occurs when an athlete who sustains a head injury – often a concussion or worse injury, such as a cerebral contusion – sustains a second head injury before symptoms associated with the first have cleared.<sup>9,10,11,12</sup>

50. Typically, the athlete suffers postconcussion symptoms after the first head injury. These may include headache, labyrinthine dysfunction, visual, motor, or sensory changes or mental difficulty, especially the thought and memory process. Before these symptoms resolve, which may take days or weeks, the athlete returns to competition and receives a second blow to the head.

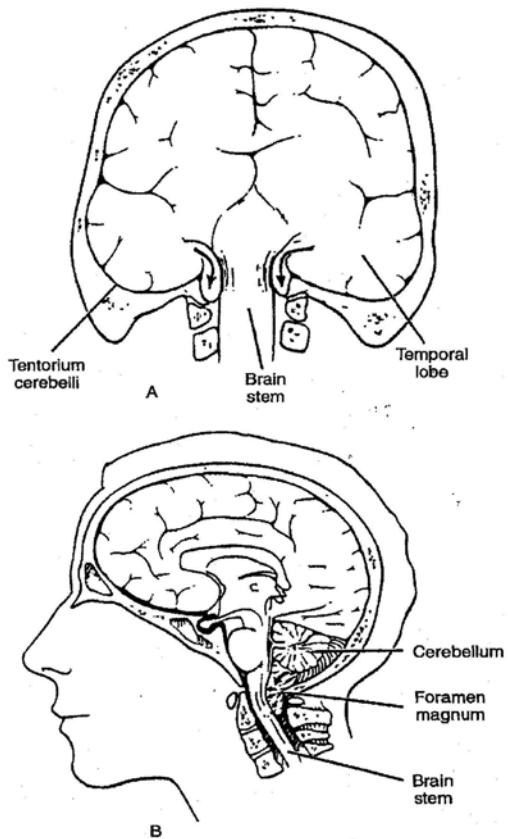
51. The second blow may be remarkably minor, perhaps only involving a blow to the chest that jerks the athlete's head and indirectly imparts accelerative forces to the brain. Affected athletes may appear stunned but usually do not lose consciousness and often complete the play. They usually remain on their feet for 15 seconds to one minute or so but seem dazed. Often, affected athletes remain on the playing field or walk off under their own power.

52. What happens in the next 15 seconds to several minutes sets this syndrome apart from a concussion. Usually within seconds to minutes of the second impact, the athlete – conscious yet stunned – quite precipitously collapses to the ground, semicomatose with rapidly dilating pupils, loss of eye movement, and evidence of respiratory failure.

53. The pathophysiology of SIS is thought to involve a loss of autoregulation of the brain's blood supply. This loss of autoregulation leads to vascular engorgement within the cranium, which, in turn, markedly increases intracranial pressure and leads to herniation either of the medial surface (uncus) of the temporal lobe or lobes below the tentorium of the cerebellar tonsils through the foramen magnum (Fig. 1). Animal research has shown that vascular engorgement of the brain after a mild head injury is difficult, if not impossible, to control.<sup>13,14</sup> The usual time from second impact to brainstem failure is rapid, taking 2 to 5 minutes. Once brain herniation and brainstem compromise occur, ocular involvement and respiratory failure

precipitously ensue. Demise occurs far more rapidly than usually seen with an epidural hematoma. MR imaging and CT scan are the neuroimaging studies most likely to demonstrate the SIS. Although MR imaging is the more sensitive to traumatic brain injuries, especially true edema,<sup>15,16</sup> the CT scan is usually adequate to show bleeding or midline shifts of the brain requiring neurosurgical intervention.

**Figure 1**



**Figure 1** In second impact syndrome, vascular engorgement within the cranium increases intracranial pressure, leading to herniation of the uncus of the temporal lobe (arrows) below the tentorium in this frontal section (A), or to herniation of the cerebellar tonsils (arrows) through the foramen magnum in this midsagittal section (B). These changes compromise the brain stem, and coma and respiratory failure rapidly develop. The shaded areas of the brain stem represent the areas of compression.

54. While second impact syndrome typically does not occur with intracranial bleeding, a number of cases of second impact syndrome have been reported where acute hemisphere swelling has occurred in association with a thin subdural hematoma in athletes receiving the second injury while still symptomatic from the first.<sup>17</sup>

#### **D. Post-Concussion Syndrome**

55. When post-concussion symptoms persist beyond a month, most refer to this condition as post-concussion syndrome (PCS). It can be thought of as a very severe concussion and its presence should be recorded in the medical record. Persistent PCS beyond a year is felt by some to be a contraindication to ever return to a collision sport. While most cases of PCS

eventually recover, not every case does recover. The connection between persistent cases of PCS and chronic traumatic encephalopathy at this time is not clear.

#### **E. Chronic Traumatic Encephalopathy**

56. Repetitive mild traumatic brain injury can trigger the development of chronic traumatic encephalopathy (CTE), a progressive neuro-degeneration characterized by the widespread deposition of hyperphosphorylated tau (p-tau) as neurofibrillary tangles.<sup>18</sup> CTE was originally reported in 1928 by Harrison Martland a New Jersey pathologist, who described the clinical aspects of a progressive neurological deterioration ('punch drunk') that occurred after repetitive brain trauma in boxers.<sup>19</sup> Although originally termed 'dementia pugilistica,'<sup>20</sup> the recognition that activities other than boxing were associated with its development lead to the preferred use of terms such as progressive traumatic encephalopathy and later, CTE.<sup>21</sup>

57. CTE is clinical associated with symptoms of irritability, impulsivity, aggression, depression, short-term memory loss and heightened suicidality that usually begin 8-10 years after experiencing repetitive mild traumatic brain injury.<sup>22</sup> With advancing disease, more severe neurological changes develop that include dementia, gait and speech abnormalities and Parkinsonism. In late stages, CTE may be clinically mistaken for Alzheimer's disease or frontotemporal dementia.<sup>23</sup> A subset of cases with CTE is associated with motor neuron disease (MND).<sup>24</sup>

58. The neuropathological changes of CTE are distinctive and easily distinguished from other tauopathies, including Alzheimer's atrophy of the cerebral cortex, medial temporal lobe, diencephalon and mammillary bodies with enlarged ventricles; cavum septum pellucidum, often with fenestrations; extensive p-tau-immunoreactive neurofibrillary tangles and astrocytic tangles in the frontal and temporal cortices, particularly around small cerebral vessels and at the depths of cerebral sulci; extensive p-tau-immunoreactive neurofibrillary tangles in limbic regions, diencephalon and brainstem nuclei; extensive degeneration of axons and white matter fibre bundles; TAR DNA-binding protein 43 (TDP-43) immunoreactive intraneuronal and intraglial inclusions and neuritis in most cases and a relative absence of amyloid-B peptide deposits.<sup>25</sup>

59. In 2008, the Center for the Study of Traumatic Encephalopathy (CSTE) at Boston University School of Medicine established the CSTE brain bank at the Bedford VA Hospital to analyse the brain and spinal cords after death of athletes, military veterans and civilians who experienced repetitive mild traumatic brain injury. Through this effort, we comprehensively analysed the brain and spinal cord of 85 donors for evidence of CTE, as well as for all other neurodegenerative diseases, including Alzheimer's disease, frontotemporal lobar degeneration (FTLD), Parkinson's disease, Lewy body disease and multiple system atrophy.

60. We reported this series in the journal Brain.<sup>26</sup> CTE was found in 68 of 85 cases including 64 athletes, 21 military veterans, and one individual who indulged in self injurious head banging behavior. Of the athletes 49 were football players, 34 were former professional football players, nine had played only college football, and six had played only high school football. At this time the incidence and prevalence of CTE is not known. Neither are the genetic and environmental factors that may predispose one suffering multiple repetitive mild traumatic brain trauma to develop CTE.

## V. TESTING FOR CONCUSSION IN SPORT

### A. Baseline Testing

61. Baseline testing is recognized as desirable by clinicians. While normative data is available it is recognized that it is best to compare one's performance to one's own baseline. This is true whether we are speaking of neuropsychological testing, balance testing, or other aspects of the neurological examination. For instance, if one's balance or intellect is extremely superior, this athlete could be impaired and yet score in the average range. Only by having a baseline in the superior range would one see this deterioration. This baseline testing is very desirable and should be offered whenever possible.

### B. Neuropsychological Testing

62. The application of neuropsychological (NP) testing in concussion has been shown to be of clinical value and contributes significant information in concussion evaluation. Both the NATA Position Statement and International Consensus Statements provide that neuropsychological testing is one of the "cornerstones" of appropriate concussion management. Although in most cases cognitive recovery largely overlaps with the time course of symptom recovery, it has been demonstrated that cognitive recovery may occasionally precede or more commonly follow clinical symptom resolution, suggesting that the assessment of cognitive function should be an important component in the overall assessment of concussion and in particular, any return to play protocol. It must be emphasized however, that NP assessment should not be the sole basis of management decisions. Rather, it should be seen as an aid to the clinical decision-making process in conjunction with a range of assessments of different clinical domains and investigational results.

63. It is recommended that all athletes should have a clinical neurological assessment (including assessment of their cognitive function) as part of their overall management. This will normally be done by the treating physician often in conjunction with computerized neuropsychological screening tools.

64. Neuropsychological testing is especially critical in athletes who might have a proclivity to minimize symptoms. Neurocognitive testing, with or without a baseline available,

can uncover deficits that would alert a trained clinician that recovery had not occurred and would then lead to prudent management of the concussion.

## VI. INCIDENCES OF CONCUSSION IN NCAA SPORTS

### A. Incidences of Concussions in NCAA Sports

65. I reviewed certain documents produced by the NCAA that summarize data collected by the NCAA Injury Surveillance System (ISS). The NCAA has been collecting concussion injury rates in football since at least 1986.<sup>27</sup>

66. More than 300,000 concussions occur every year, and participation in sport is a common cause of these injuries. These injuries are often difficult to detect, with athletes often underreporting their injury, minimizing their importance or not recognizing that an injury has occurred. At the college level, these injuries are more common in certain sports, such as football, ice hockey, men's and women's soccer, and men's lacrosse. However, they also account for a significant percentage of injuries in men's and women's basketball, women's lacrosse, and other sports traditionally considered "noncontact."

67. The incidence in helmeted versus nonhelmeted sports is also similar. In the years 2000 to 2002, the rate of concussion during games per 1,000 athlete exposures for football was 3.1, for men's ice hockey 2.4, for men's wrestling 1.6, for men's lacrosse 1.4, for women's ice hockey 2.4, for women's soccer 2.1, for men's soccer 1.7, for field hockey 0.8, for women's lacrosse 0.8, for women's basketball 0.7, and for men's basketball 0.5, accounting for between 6.4 and 18.3 percent of the injuries for these sports as reported by the NCAA Injury Surveillance System (ISS).

68. The NCAA released its injury surveillance data for the 2005-2006 football season and it continued to show high rates of concussions and head injuries.<sup>28</sup> Specifically, head injuries accounted for 11% of practice and 5% of game injuries.<sup>29</sup> "Concussions ranked third highest in both practice and competition."<sup>30</sup> In addition, "a team averaging 60 game participants could expect one concussion every five games. Seven percent of all practice and game injuries involved concussions."<sup>31</sup>

69. The men's ice hockey injury surveillance data for 2005-2006 had similarly high rates of concussions and head injuries.<sup>32</sup> Specifically, for practices, concussions constituted 12% of all injuries and 7% of all injuries in 2005-2006.<sup>33</sup> In addition, for games, concussions constituted 16% of all injuries and 12% of all injuries in 2005-2006. *Id.* Another figure in the NCAA release shows that head injuries accounted for 14% of all injuries in 2005-2006 and 17% of all injuries in 2004-2005.<sup>34</sup> And, head injuries constituted 16% of all injuries in practices for the years 2004-2005 and 2005-2006.<sup>35</sup>

70. Finally, the 2005-2006 Injury Surveillance System report for men's soccer showed that concussions accounted for 6% of all competition injuries.<sup>36</sup> Head injuries accounted for 11% and 12% of all injuries in 2005-2006 and 2004-2005 respectively.<sup>37</sup>

71. In 2007, the NCAA furthered its knowledge regarding the commonality of concussions among its student-athletes. In a series of articles co-authored by the NCAA's Randy Dick and published in the *Journal of Athletic Training*, Dick reviewed the NCAA's injury surveillance data from 1988-1989 to 2003-2004 across men's and women's sports in order to identify potential areas for injury prevention initiatives. Dick made numerous observations regarding the commonality of concussion across NCAA sports, using the NCAA's own injury data. Concussion specific observations include but are not limited to:

- a. Men's Basketball: concussions were the fourth most common game and eighth most common practice injury;<sup>38</sup>
- b. Women's Field Hockey: concussions were the third most common game injury and ninth most common practice injury, stating "Concussion and head laceration injuries increased over this same time, and the risk of sustaining a concussion in a game was 6 times higher than the risk of sustaining one in practice";<sup>39</sup>
- c. Men's Football: concussions were the third most common game injury, fourth most common fall and spring practice injury, and eighth most common practice injury;<sup>40</sup>
- d. Women's Gymnastics: concussions were the sixth most common game and eighth most common practice injury;<sup>41</sup>
- e. Men's Ice Hockey: concussions were the second most common game and fourth most common practice injury, adding "Concussions and facial injuries remain a significant concern in ice hockey";<sup>42</sup>
- f. Women's Ice Hockey: concussions were the most common game and practice injury, adding "Concussions were the most common injury sustained in practices as well as in games. The upward trend in the rate of game concussions in women's ice hockey is of great concern," that "[t]he relatively high rate of concussions in games and the high number of player-contact injuries relative to other mechanisms raise the question regarding the effectiveness

of the current rules against body checking,” and that “[i]t is also possible that inconsistent enforcement of the rules resulted in this higher incidence of concussions”;<sup>43</sup>

- g. Men’s Lacrosse: concussions were the third most common game and fifth most common practice injury;<sup>44</sup>
- h. Women’s Lacrosse: concussions were the third most common game and sixth most common practice injury;<sup>45</sup>
- i. Men’s Soccer: concussions were the fifth most common game and eleventh most common practice injury, noting that “concussions continue to be a prominent concern in soccer” and that “Our preventive efforts should spotlight the nature of the contact leading to concussions and lower extremity injury, as well as the rules in place to limit the frequency and severity of these injuries”;<sup>46</sup>
- j. Women’s Soccer: concussion were the third most common game and seventh most common practice injury, adding that “[t]hese results are not surprising and underscore the need for prevention of lower extremity injuries and concussions” and also that “concussions continue to be a concern during games”;<sup>47</sup>
- k. Women’s Softball: concussions were the third most common game and ninth most common practice injury;<sup>48</sup>
- l. Women’s Volleyball: concussions were the fifth most common game and fourteenth most common practice injury;<sup>49</sup>
- m. Men’s Wrestling: concussions were the fourth most common game and sixth most common practice injury.<sup>50</sup>

72. The data from the ISS reflected an estimated 29,225 Total Concussions in NCAA Sports from 2004-2009. In addition, the statistics show that approximately 16,277 of these occurred in football which is more than all other fall sports combined.<sup>51</sup> However, according to the NCAA’s Director of Health and Safety in 2010: “Too many people think concussion is just a football injury, but from the NCAA’s perspective, it’s a condition that is a concern across all the sports.”<sup>52</sup>

73. The NCAA produced the following table of concussion rates:

SUPPLEMENT NO. 19  
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**Deliverable 2011-07**  
**Concussions in NCAA Sports 2004/05 to 2008-09**  
updated April 25 2011

<b>Sport</b>	<b>Concussions in NCAA (average over 2004-05 to 2008-2009 school years)</b>					
	<b>Rate of Competition Concussion (per 1,000 A-Es)</b>	<b>% of Injuries Competition</b>	<b>Median Days Out Practice and Competition</b>	<b>Injury Frequency Rank Practice and Competition</b>	<b>Specific Injury Rank Practice and Competition</b>	<b>National Annual Estimate Practice and Competition</b>
M. Football	2.9	7.9	7	4	2	3,064
M. Lacrosse	2.5	15.2	7	4	2	334
M. Ice Hockey	2.1	13.5	6	4	2	259
W. Ice Hockey	2.1	27.6	7	1	1	143
W. Soccer	2.0	13.8	7	4	2	1,021
M. Wrestling	1.6	5.9	9	6	4	281
M. Soccer	1.3	7.5	5	4	3	608
W. Lacrosse	1.2	17.9	5	3	1	235
W. Field Hockey	1.1	11.4	4	4	3	136
W. Basketball	1.0	10.7	5	4	2	787
M. Basketball	0.6	5.9	4	4	2	624
W. Softball	0.4	8.4	6	4	2	339
M. Baseball	0.2	4.0	6	7	4	261
W. Volleyball	0.2	5.6	6	6	2	221
W. Gymnastics	0.0	0.0	9	7	3	22
<b>Total Sport Annual Concussion Estimate</b>						<b>8,335</b>

**Specific Injury Rank:** concussions rank among all other injuries.

**National Annual Estimate:** total number of concussions per year in entire NCAA

**Inclusion criteria:**

- Limited to concussions with 1 or more days' time loss ("release data")
- concussions occurred during preseason, regular or postseason
- concussions occurred during competition or practice events



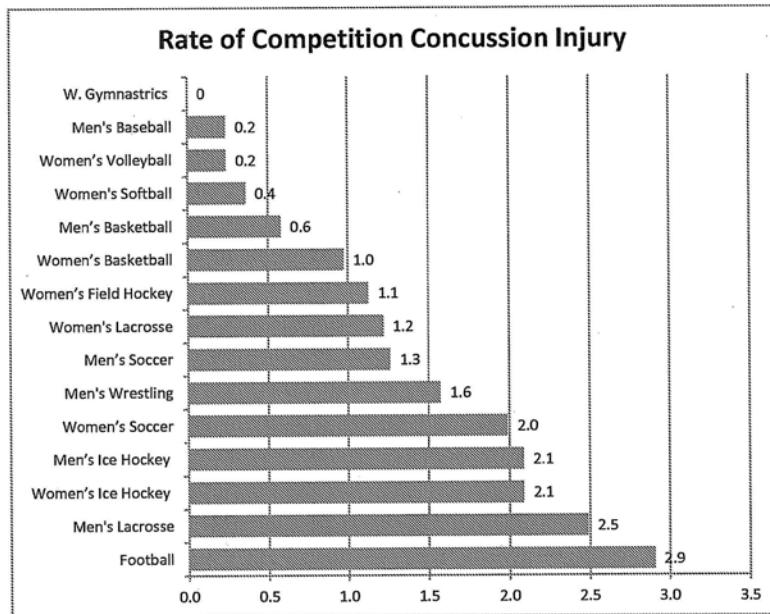
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NCAA00013786

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**Concussions in NCAA Sports 2004/05 to 2008-09**  
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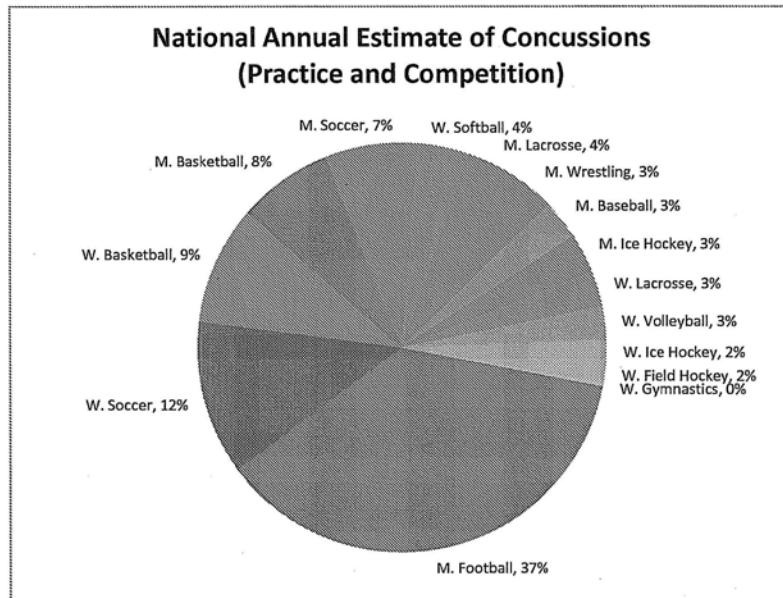
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NCAA00013787

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**Deliverable 2011-07**  
**Concussions in NCAA Sports 2004/05 to 2008-09**  
updated April 25 2011



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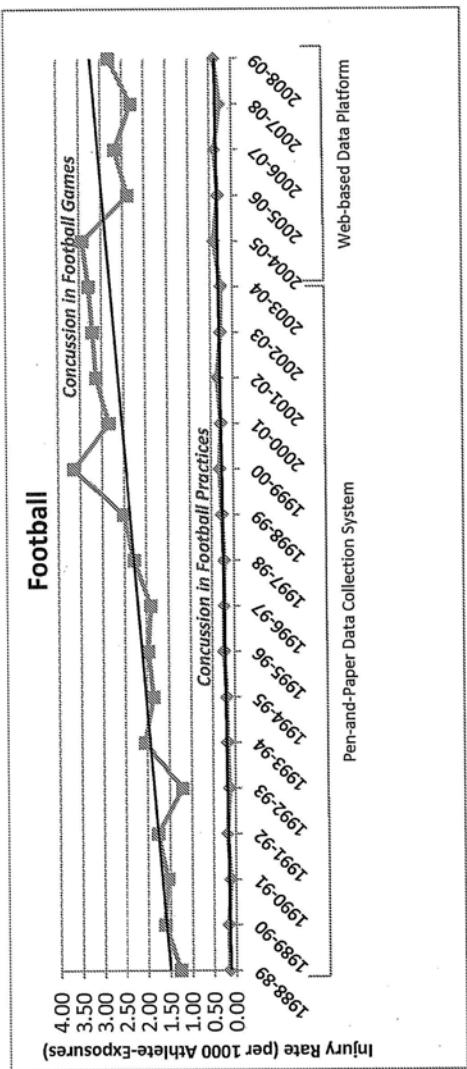
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NCAA00013788

SUPPLEMENT NO. 19  
CONFIDENTIAL - FOR ASSOCIATION PURPOSES



DELIVERABLE 2009-04: FOOTBALL CONCUSSION TRENDS



3

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NCAA00013793

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SUPPLEMENT NO. 19**DELIVERABLE 2009-03: NCAA CONCUSSION INCIDENCE AND TRENDS**

Concussions in football most frequently arose from player contact in blocking and tackling. Nearly one-third of concussions in men's and women's soccer games were due to direct player contact while heading the ball. In Field Hockey "Contact with apparatus" (mostly stick and ball) accounted for over  $\frac{1}{2}$  of competition injuries.

**Table 1. Summary of concussion incidence in 5 fall sports, 2004-2009**

Sport	Time	Injury Count			% of Injuries			Injury Count			% of Injuries			Overall	Days Lost	Overall	Days Lost	Median	Rank
		Specific Injury	Competition	Practice	Competition	Days Lost	Practice	Injury Count	Median	Days Practice	Injury Count	Median	Days Practice						
Football		6,821	6.60%	6	9,457	5.80%	6	16,277	6.10%	6	3,374	4.60%	5	2nd					
Men's Soccer	2004-09	2,232	6.20%	6	1,142	3.00%	3	5,751	7.20%	7	1,606	3.90%	6	2nd					
Women's Soccer		4,145	10.70%	6	1,606	3.90%	7	6,85	4.70%	4	201	2.30%	4	4th					
Field Hockey		484	8.70%	4	739	2.50%	4	1,209	2.90%	5	1,145	4.68%	5	4th					
Volleyball		469	3.90%	6															
<b>TOTAL</b>	<b>2004-09</b>	<b>14,151</b>	<b>7.23%</b>		<b>13,145</b>	<b>4.68%</b>		<b>27,296</b>	<b>5.73%</b>										

**Table 2. Summary of concussion average annual incidence in 5 fall sports, 2004-2009**

Sport	Time	Injury Count			Injury Count			Injury Count			Overall	Days Lost	Median	Rank
		Specific Injury	Competition	Practice	Competition	Practice	Injury Count	Competition	Practice	Injury Count				
Football		1,364			1,364		1,891			3,255				
Men's Soccer	Annual Average	446	228	189	446	228	675							
Women's Soccer		829	321	137	829	321	1,150							
Field Hockey		97	40	137	97	40	137							
Volleyball		94	148	242	94	148	242							
<b>TOTAL</b>	<b>Ann.Avg.</b>	<b>2,830</b>	<b>2,629</b>	<b>5,459</b>										

2

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NCAA00013795

**B. Underreporting of Concussions**

74. Underreporting of concussions exists in all sports and is a special challenge in a few sports such as football and ice hockey. Football's rules and rhythms camouflage the problem. In a football game, there is more "stop time" than 'go time' – thirty seconds between plays, four or five seconds for the average play. A player who gets knocked silly has a few seconds to recover, remember where he is, and get back to the huddle. Unless he's the quarterback, he isn't speaking in the huddle. He's wearing a huge helmet. No one can look into

his eyes if they're trying, which they probably aren't. Line up these factors and a running back might be able to play a series or even a half before it is discovered he was playing impaired.

75. Underreporting of concussions in youth ice hockey has been documented in several studies; a recently published one suggests the problem is significant. The study's primary author is Dr. Paul Echlin, a physician from London, Ontario, who worked with researchers from an organization called the Hockey Concussion Education Program.<sup>53</sup> Dr. Echlin and his colleagues followed two junior hockey teams in Ontario throughout the 2009-10 Season. These were highly competitive teams – a number of players hoped to graduate to college hockey programs. The players' ages ranged from sixteen to twenty-one.

76. The purpose of the study was simple enough: to track the number of concussions reported among the players on the two teams. Just as important, Dr. Echlin was looking for evidence of possible concussions that were missed by either coaches, medical personnel, or the players themselves. Or simply ignored.

77. When it was released in 2010, the study garnered a great deal of attention; the findings were that alarming. Foremost was that ice hockey is a much more dangerous game than was previously thought, at least more dangerous the way it was being played by the two teams in Dr. Echlin's study.

78. An earlier study looking at NCAA Division I programs had reported a rate of 3.1 concussions per 1,000 man-games. The Echlin study, observing athletes of roughly the same age playing exactly the same sport, found a rate nearly seven times greater than that – 21.5 concussion per 1,000 man-games.

79. It was more troubling than just the greater number. The Echlin study described a culture in which concussions were not treated as a serious health issue or, it seemed, an issue at all. Players described being under pressure from their coaches to continue playing even when they'd been told by medical professionals that they'd suffered concussions and should take time off. The attitudes of some parents were even more puzzling. One told the research team that it should leave the team and let his child go back to thinking about hockey instead of the potential for injury: "He needs to play on instincts and can't be worried about getting a concussion every time he goes into a corner." The researchers might have heard more comments like that had they been allowed to complete the season with both teams – they weren't. The general manager of one pulled his team out of the study midway through the season, telling the researchers that he didn't want his players submitting to in-game examinations anymore.

80. An interesting angle of the study is the way in which the researchers collected information. At the hockey games, physician observers were placed in the stands. When one saw somebody get up slowly or noticed that a player seemed stunned from a blow, the observer would note it and between periods go to the locker room to examine the player involved. The examinations often turned up concussions that coaches, players, and on-the-bench medical personnel themselves had overlooked. For every concussion picked up by coaches and players, the physician observers picked up seven.

81. Moreover, the NCAA was aware that student athletes do not self-report. The Director of Health and Safety admitted: “College age athletes often minimize symptoms and/or under-report their injuries and may not understand the consequences of playing with a concussion.”<sup>54</sup> The NCAA acknowledges that “[a]thletes may not report their symptoms for fear of losing playing time.”<sup>55</sup>

82. The recognition that student-athletes underreport is one of the reasons that the standards for testing for concussions, including baseline testing and neurocognitive testing, is a cornerstone in concussion management.

## VII. THE RELEVANT NCAA CONSTITUTION AND BY LAWS

83. I asked plaintiffs’ counsel to provide for me any NCAA rules and/or regulations regarding the NCAA’s role with respect to the safety of student athletes. I reviewed the NCAA’s concussion management in the context of the obligations it undertook in these documents. The particular provisions I have in mind in assessing if the NCAA met its duty of care are set forth below.

84. The NCAA Constitution defines the NCAA’s purposes and fundamental policies to include maintaining control over and responsibility for intercollegiate sports and student-athletes. The NCAA Constitution states in pertinent part:

“The purposes of this Association are:

- (a) To initiate, stimulate and improve intercollegiate athletics programs for student athletes....;
- (b) to uphold the principal of institutional control of, and responsibility for, all intercollegiate sports in conformity with the constitution and bylaws of this association;....”

NCAA Const., Art.1, § 1.2(a),(b). The NCAA Constitution also identifies one of its “Fundamental Policies” as the requirement that “Member institutions shall be obligated to apply and enforce this legislation, and the enforcement procedures of the Association shall be applied to an institution when it fails to fulfill this obligation.”<sup>56</sup>

85. Article 2.2 of the NCAA Constitution specifically governs the “Principle of Student-Athlete Well-Being,” and provides in pertinent part:

“2.2 THE PRINCIPLE OF STUDENT-ATHLETE WELL-BEING

Intercollegiate athletics programs shall be conducted in a manner designed to protect and enhance the physical and educational well-being of student-athletes. (*Revised: 11/21/05.*)

\* \* \*

**2.2.3 Health and Safety.** It is the responsibility of each member institution to protect the health of, and provide a safe environment for, each of its participating student-athletes. (*Adopted: 1/10/95.*)”

86. In fact, the NCAA Constitution mandates that “each member institution must establish and maintain an environment in which a student-athlete’s activities are conducted as an integral part of the student-athlete’s educational experience.” NCAA Const., Art. 2, § 2.2.1 (*Adopted: 1/10/95.*).

87. To aid member institutions with the tools that they need to comply with NCAA legislation, the NCAA Constitution promises that “[t]he Association shall assist the institution in its efforts to achieve full compliance with all rules and regulations....”<sup>57</sup>

88. The NCAA has consistently recognized its duty to provide a safe environment for student-athletes. For example, the NCAA’s website states: “Part of the NCAA’s core mission is to provide student-athletes with a competitive environment that is safe and ensures fair play. While each school is responsible for the welfare of its student-athletes, the NCAA provides leadership by establishing safety guidelines, playing rules, equipment standards, drug testing procedures and research into the cause of injuries to assist decision making. By taking proactive steps to student-athletes’ health and safety, we can help them enjoy a vibrant and fulfilling career.”<sup>58</sup>

89. The NCAA maintains The Committee on Safeguards and Medical Aspects of Sports, which is publicly touted by the NCAA as “serv[ing] to provide expertise and leadership to the NCAA in order to provide a healthy and safe environment for student-athletes through research, education, collaboration and policy development.”<sup>59</sup>

90. The NCAA promises its athletes a safe environment as recently as August 27, 2012, where its website states:

“The NCAA takes appropriate steps to modify safety guidelines, playing rules and standards to minimize those risks and provide student athletes with the best opportunity to enjoy a healthy career. The injury surveillance program collects, analyzes, interprets and disseminates data on injuries in each sport, providing a wealth of

information through which we can provide athletes with a safe competitive environment.”

91. One of the NCAA’s “core concepts and priorities” was to use its knowledge to promote health and safety:

“The NCAA has been conducting injury surveillance for more than 20 years. Over time, the underlying principle of the program has remained unchanged – to promote and support student athlete health and safety.”<sup>60</sup>

92. In fact, the NCAA explains on its website how it promises to use the injury surveillance data it collects:

“How does [the injury surveillance data] help prevent sports injuries?

Once we know how they occur we can take the necessary steps to reduce student-athletes’ exposure to situations that cause injuries. For instance, we can make adjustments to rules – such as eliminating tackling techniques in football or high-sticking in ice hockey – to reduce situations that expose student-athletes to high risks of injury. Or we can adjust equipment requirements and standards to increase safety.”<sup>61</sup>

93. On an annual basis, the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports publishes (“Medical Committee”) the NCAA Sports Medicine Handbook (“Handbook”) “to formulate guidelines for sports medicine care and protection of student-athletes’ health and safety” and “to assist member schools in developing a safe intercollegiate athletic program.”<sup>62</sup> The Medical Committee recognizes that the Handbook “may constitute some evidence of the legal standard of care.” The Handbook expressly recognizes that “student-athletes *rightfully assume* that those who sponsor intercollegiate athletics have taken reasonable precautions to minimize the risks of injury from athletics participation.”<sup>63</sup>

94. In discussing the “Shared Responsibility for Intercollegiate Sports Safety,” the NCAA states that:

“In an effort to do so [i.e. take reasonable precautions to minimize the risks of injury from athletics participation], the NCAA collects injury data in intercollegiate sports. When appropriate, the NCAA Committee on Competitive Safeguards and Medical Aspects of

Sports makes recommendations to modify safety guidelines, equipment standards, or a sport's rules of play.”<sup>64</sup>

95. Thus, the NCAA has recognized, time and again, its responsibility for the health and well-being of student-athletes.

## **VIII. CONSENSUS BEST PRACTICES FOR MANAGING SPORTS-RELATED CONCUSSION**

### **A. The First Return to Play Guidelines**

96. In 1986, I published the first “Return to Play” guidelines in a peer-reviewed journal, *Physician and Sports Medicine*, with the intention of moving toward a universal standard. Over the years, these guidelines became an integral part of the care received by athletes. They classified concussions by grades one, two, and three, three being the most severe. At each grade, there were recommendations as to how the player should be handled. A player with a grade two concussion, for instance, was held out a minimum of two weeks if he was symptom-free for seven days. A player with a grade three concussion whose trauma caused him to lose consciousness for minutes was out for at least a month. The “Return to Play” protocol was intended to augment, not replace, clinical judgments.

97. In the decades since the first guidelines, more than thirty alternatives have been published but there are some critical documents that I believe represent the consensus best practices.

### **B. Consensus Best Practices for the Period 2002-Present**

#### **1. Vienna Protocol**

98. As of 2002, consensus had been reached in the medical and scientific community for the cornerstones of the management and treatment of concussions.

99. The “Summary and Agreement Statement of the First International Conference on Concussion and Sport, Vienna 2001” (“International Consensus Statement” or “Vienna Protocol”) was published in early 2002 simultaneously in the *Clinical Journal of Sports Medicine*, *Physician and Sports Medicine* and *British Journal of Sports Medicine*.<sup>65</sup> The expert group who compiled the International Consensus Statement, known as the “Concussion in Sport Group,” was comprised of a panel of world experts and was organized by the International Ice Hockey Federation, the Federation Internationale de Football Association Medical Assessment and Research Center (*i.e.*, FIFA), and the International Olympic Committee Medical Commission (IOC). The International Consensus Statement was intended to be, and accepted as, “a comprehensive systematic approach to concussion to aid the injured athlete and direct management decisions.” It was also intended to “be widely applicable to sport related

concussion” and “developed for use by doctors, therapists, health professionals, coaches, and other people involved in the care of injured athletes, whether at the recreational, elite, or professional level.” The Concussion in Sport Group subsequently met in Prague (2004),<sup>66</sup> Zurich (2008),<sup>67</sup> and Zurich (2012), and published updated Consensus Statements. The International Consensus Statement set forth a revised definition of concussion, a standard concussion management protocol, and discussed the issues of prevention, education, and future directions for the injury.

100. The first International Symposium on Concussion in Sport was held in Vienna, Austria (“Vienna Conference”) in 2001. The goal was to provide recommendations for the improvement of safety and health of athletes who suffer concussive injuries. The result of the conference was the publication of a consensus statement that was “a comprehensive systematic approach to concussion to aid the injured athlete and direct management decisions” (“Vienna Protocol”). The publication was intended to “be widely applicable to sport related concussion” and was “developed for use by doctors, therapists, health professionals, coaches, and other people involved in the care of injured athletes, whether at the recreational, elite, or professional level.”

101. The Vienna Protocol recommended specific return to play guidelines. The Vienna Protocol stated:

“When a player shows ANY symptoms or signs of a concussion:

- (1) The player should not be allowed to return to play in the current game or practice.
- (2) The player should not be left alone; and regular monitoring for deterioration is essential.
- (3) The player should be medically evaluated after the injury.

Return to play must follow a medically supervised stepwise process.

A player should never return to play while symptomatic. ‘When in doubt, sit them out!’”

102. The Vienna Protocol also recommended a return to play stepwise process as follows:

“It was the consensus of the CISG that a structured and supervised concussion rehabilitation protocol is conducive to optimal injury recovery and safe and successful return to play. The rehabilitation principles were common to all identified programmes and are

outlined below. Important principles state that the athlete be completely asymptomatic and have normal neurological and cognitive evaluations before the start of the rehabilitation programme. Therefore, the more prolonged the symptom duration, the longer the athlete will have sat out. The athlete will then proceed stepwise with gradual incremental increases in exercise duration and intensity, and pause or backtrack with any recurrence of concussive symptoms. It is appreciated that, although each step may take a minimum of one day, depending on the duration of symptoms, proceeding through each step may take longer in individual circumstances.”

103. The Vienna Protocol provided that return to play after a concussion follows a stepwise process:

- “(1) No activity, complete rest. Once asymptomatic, proceed to level
- (2) Light aerobic exercise such as walking or stationary cycling.
- (3) Sport specific training - for example, skating in hockey, running in soccer.
- (4) Non-contact training drills.
- (5) Full contact training after medical clearance.
- (6) Game play.

With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. If any symptoms occur after concussion, the patient should drop back to the previous asymptomatic level and try to progress again after 24 hours.”

104. In regards to sideline evaluation, the Vienna Protocol noted that “[S]ideline evaluation includes clinical evaluation of signs and symptoms, ideally using a standardized scale of postconcussion symptoms for comparison purposes, and acute injury testing as described below under neuropsychological testing.” The Vienna Protocol recommended tests such as the Maddock’s questions and the Standardized Assessment of Concussion (SAC) as effective in concussion diagnosis and also stated:

“Sideline evaluation including neurological assessment and mental status testing is an essential component in the protocol. These evaluations are ideally developed in language translations for international sporting groups...In the acute assessment of

concussive injury - that is, concussion diagnosis - brief neuropsychological test batteries that assess attention and memory function have been shown to be practical and effective. Such tests include the Maddock's questions and the Standardised Assessment of Concussion (SAC). It is worth noting that standard orientation questions - for example, time, place, person - have been shown to be unreliable in the sporting situation compared with memory assessment.

It is recognised, however, that abbreviated testing paradigms are designed for rapid evaluation of concussion on the sidelines and are not meant to replace comprehensive neuropsychological testing, which is sensitive enough to detect subtle deficits that may exist beyond the acute episode.”

105. In regards to baseline testing and neuropsychological testing, the Vienna Protocol provided that “Overriding principles common to all neuropsychological test batteries is the need for and benefit of baseline preinjury testing and serial follow up.” It noted that the application of neuropsychological testing “has shown to be of value and continues to contribute significant information in concussion evaluation...It has been shown that cognitive recovery may precede or follow resolution of clinical symptoms, suggesting that the assessment of cognitive function should be an important component in any return to play protocol.” Further, “[T]he consensus of the CISG was that neuropsychological testing is one of the cornerstones of concussion evaluation and contributes significantly to both understanding of the injury and management of the individual. Organised sport federations have access to and should attempt to employ such testing as appropriate. To maximise the clinical utility of such neuropsychological assessment, baseline testing is recommended.”

106. Finally, the Vienna Protocol acknowledged education of athletes, colleagues, those working with athletes and the general public as a “mainstay of progress in this field.” The Vienna Protocol also recommended the “consideration of rule changes” and noted that “rule enforcement is a critical aspect of such approaches and referees play an important role.”

## **2. 2004 National Athletic Trainers' Association Position Statement: Management of Sport-Related Concussion**

107. A second consensus document on concussion management was issued in 2004 when the National Athletic Trainers Association (“NATA”) published a position statement regarding concussion management.<sup>68</sup> NATA provided extensive recommendations including that “decisions about an athlete’s return to practice should never be based solely on the use of any one test.” It also recommended a “cautious clinical judgment” which “takes into account all evaluation options.”

108. Specifically, the NATA Position Statement stated:

“Return to participation after severe or repetitive concussive injury should be considered only if the athlete is completely symptom free and has a normal neurologic examination, normal neuropsychological and postural-stability examinations, and, if obtained, normal neuroimaging studies (ie, MRI with gradient echo). It may not be practical or even possible to use all these assessments in all athletes or young children, but a cautious clinical judgment should take into account all evaluation options. Each injured athlete should be considered individually, with consideration for factors including age, level of participation, nature of the sport (high risk versus low risk), and concussion history. Standardized neuropsychological testing, which typically assesses orientation, immediate and delayed memory recall, and concentration may assist the ATC and physician in determining when to disqualify an athlete from further participation. Balance testing may provide additional information to assist the clinician in the decision-making process of whether to disqualify an individual after a concussion. When to disqualify the athlete is one of the most important decisions facing the ATC and team physician when dealing with an athlete suffering from a concussion. This includes not only when to disqualify for a single practice or event but also when to disqualify for the season or for a career.”

109. It further stated:

“The decision to disqualify an individual from further participation on the day of the concussive episode is based on the sideline evaluation, the symptoms the athlete is experiencing, the severity of the apparent symptoms, and the patient’s past history. The literature is clear: any episode involving LOC or persistent symptoms related to concussion (headache, dizziness, amnesia, and so on), regardless of how mild and transient, warrants disqualification for the remainder of that day’s activities.”

110. The NATA position statement similarly recommended baseline testing; the use of objective concussion assessment tools; a combination of screening tools for the sideline; and implementation of a neuropsychological testing program with evaluations by persons appropriately trained in the test administration and scoring (ideally by a neuropsychologist).

### 3. 2006 American College of Sports Medicine Concussion Consensus Statement

111. The American College of Sports Medicine's "Concussion (Mild Traumatic Brain Injury) and the Team Physician: A Consensus Statement" provided that a detailed/systematic plan for the team physician to follow in the evaluation of an individual for concussion on the sideline should be developed; noted that post injury neuropsychological data is more useful if compared to a baseline; a team physician should perform serial neurological assessments as an essential function; that it is desirable that the education of the athlete and others about concussion; and that helmets do not prevent, and may actually increase, the incidence of concussion.<sup>69</sup>

112. Regarding same-day RTP, the consensus statement provided:

"[i]t is **essential** the team physician understand:

- There is agreement that athletes with significant, persistent or worsening signs and symptoms (e.g., abnormal neurological examination, ongoing RGA or PTA, prolonged LOC) should not RTP.
- For other athletes with concussion, significant controversy exists for a same-day RTP decision and no conclusive evidence-based data are available. Areas of controversy include:
  - Returning an athlete with any symptoms to play.
  - Returning an athlete with fully resolved symptoms to play.
  - Certain symptoms, even if resolved, are contraindications to same-day RTP (e.g., any LOC, PTA, and RGA).
  - The duration and severity of symptoms are the determining factors of RTP.
  - It is the safest course of action to hold an athlete out."

113. Regarding post-game-day RTP, the consensus statement provided:

"[i]t is **essential** the team physician understand:

- Determine the athlete is asymptomatic at rest before resuming any exertional activity.
- Amnesia may be permanent.
- Utilize progressive aerobic and resistance exercise challenge tests before full RTP.
- Consider factors which may affect RTP, including:
- Severity of the current injury

- Previous concussions (number, severity, proximity)
- Significant injury in response to a minor blow
- Age (developing brain may react differently to trauma than mature brain)
- Sport
- Learning disabilities
- Understand contraindications for return to sport (e.g., abnormal neurological examination, signs or symptoms with exertion, significant abnormalities on cognitive testing or imaging studies).
- Controversy exists for postgame RTP decisions.

It is *desirable* the team physician:

- Coordinate a team to implement progressive aerobic and resistance exercise challenge tests before full RTP.
- Recognize challenging cognitive effort may exacerbate symptoms of concussion and retard recovery.
- Discuss status of athlete with parents, caregivers, teachers, certified athletic trainers and coaching staff within disclosure regulations.
- Consider neuropsychological testing.”

(emphasis in original).

**4. The National Football League’s return to play policies should have caused the NCAA to play catch up by 2007.**

114. The first return to play/concussion standards in the NFL were adopted in 2007. While the adoption by the NFL of the policy was late and incomplete, it reflected an important change that should have caused the NCAA to adopt rules also.

115. The NFL policy stated that a player should not be allowed to return in the same game if a player lost consciousness and also required mandatory baseline testing.<sup>70</sup>

116. The 2007 policy placed an emphasis on taking a conservative approach to managing concussions including “giving full consideration to a player’s medical history, including his history of concussions and recovery from any previous concussions, and taking the necessary time to conduct a thorough neurological examination, including mental status at rest and post-exertion before making a decision on returning a player to practice or play.”

117. The 2007 policy also mandated baseline testing:<sup>71</sup>

“Neuropsychological baseline testing will be required for all NFL players beginning this season, using a standardized test to establish an individual functional baseline. Neuropsychological testing is one tool a physician can use to assist in the management of MTBI. It cannot be used by itself to make clinical decisions. For players removed from games due to concussions, repeat testing will be done during the season to track recovery and to help decide when they can return to play. These players also will be re-tested against their baseline performance the following season at training camp.”

118. Finally, there is evidence that the NFL took steps to educate players in a 2007 “concussion pamphlet”:<sup>72</sup>

“(1) The player should be completely asymptomatic and have normal neurological test results, including mental status testing at rest and after physical exertion before returning to play;  
(2) Symptoms to be taken into account include confusion, problems with immediate recall, disorientation to time, place and person, anterograde and retrograde amnesia, fatigue, and blurred vision; (3) if an NFL player sustains a loss of consciousness, as determined by the team medical staff, he should not return to the same game or practice; (4) NFL team physicians and athletic trainers will continue to exercise their medical judgment and expertise in treating concussions, including considering any history of concussion in a player.”

## **5. The 2008 Zurich Protocol.**

119. The 3<sup>rd</sup> International Conference on Concussion in Sport was held in Zurich in November 2008, resulting in an update of the Vienna and Prague Protocols (“Zurich Protocol”).<sup>73</sup> Once again, the Zurich Protocol reaffirmed the need for a graduated stepwise return to play process after a concussion with a 24 hour wait period between each step. The Zurich Protocol mirrors the Prague Protocol in many respects. However, the Zurich Protocol abandoned the simple versus complex terminology developed in Prague and also identified “concussion modifiers” which may affect the recovery and outcome of return to play progress. In addition, the Zurich Protocol more specifically enumerated a process for sideline evaluation and developed another standardized concussion assessment tool (SCAT2) for use in concussion evaluation.

120. In regards to return to play, the Zurich Protocol noted:

“The cornerstone of concussion management is physical and cognitive rest until symptoms resolve and then a graded programme of exertion prior to medical clearance and return to play. The recovery and outcome of this injury may be modified by a number of factors that may require more sophisticated management strategies. These are outlined in the section on modifiers below. As described above, the majority of injuries will recover spontaneously over several days. In these situations, it is expected that an athlete will proceed progressively through a stepwise return to play strategy. During this period of recovery while symptomatic, following an injury, it is important to emphasise to the athlete that physical and cognitive rest is required. Activities that require concentration and attention (eg, scholastic work, videogames, text messaging, etc) may exacerbate symptoms and possibly delay recovery. In such cases, apart from limiting relevant physical and cognitive activities (and other risk-taking opportunities for re-injury) while symptomatic, no further intervention is required during the period of recovery and the athlete typically resumes sport without further problem.”

121. The Protocol further stated:

“Return to play protocol following a concussion follows a stepwise process . . . With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. Generally each step should take 24 hours so that an athlete would take approximately one week to proceed through the full rehabilitation protocol once they are asymptomatic at rest and with provocative exercise. If any postconcussion symptoms occur while in the stepwise programme, the patient should drop back to the previous asymptomatic level and try to progress again after a further 24-hour period of rest has passed.”

122. The Protocol included the following chart:

Graduated Return-to-Play Protocol:

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Complete physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum predicted heart rate No resistance training	Increase heart rate
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey May start progressive resistance training)	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

123. The Zurich Protocol provided: “An important consideration in RTP is that concussed athletes should not only be symptom-free but also should not be taking any pharmacological agents/medications that may mask or modify the symptoms of concussion.”

124. In regards to “Same day RTP”, the Protocol stated:

“With adult athletes, in some settings, where there are team physicians experienced in concussion management and sufficient resources (eg, access to neuropsychologists, consultants, neuroimaging, etc) as well as access to immediate (ie, sideline) neurocognitive assessment, return to play management may be more rapid. The RTP strategy must still follow the same basic management principles namely full clinical and cognitive recovery before consideration of return to play. This approach is supported by published guidelines, such as the American Academy of Neurology, US Team Physician Consensus Statement, and US National Athletic Trainers Association Position Statement. This issue was extensively discussed by the consensus panelists and it was acknowledged that there is evidence that some professional American football players are able to RTP more quickly, with even same day RTP supported by National Football League studies without a risk of recurrence or sequelae. *There are data however, demonstrating that at the collegiate and high school level, athletes allowed to RTP on the same day may demonstrate NP deficits post-injury that may not be evident on the sidelines and are more likely to have delayed onset of symptoms.* It should be emphasised

however, that the young (<18) elite athlete should be treated more conservatively even though the resources may be the same as for an older professional athlete.”

(Emphasis supplied.)

125. The Protocol also noted that the panel agreed that a range of “modifying factors” may effect concussion management: “[A] range of ‘modifying’ factors may influence the investigation and management of concussion and in some cases, may predict the potential for prolonged or persistent symptoms.” *Id.* at i79.

#### Concussion modifiers:

Factors	Modifier
Symptoms	Number Duration (>10 days) Severity
Signs	Prolonged loss of consciousness (>1 min), amnesia
Sequelae	Concussive convulsions
Temporal	Frequency—repeated concussions over time Timing—injuries close together in time “Recency”—recent concussion or traumatic brain injury
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Age	Child and adolescent (<18 years old)
Co- and pre-morbidities	Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder, learning disabilities, sleep disorders
Medication	Psychoactive drugs, anticoagulants
Behaviour	Dangerous style of play
Sport	High risk activity, contact and collision sport, high sporting level

126. The Zurich Protocol also re-emphasized the importance of neuropsychological and comparative baseline testing but noted that it should not be used as a stand alone tool or form the sole basis of management decisions but rather as an aid to the clinical decision making process. In addition, the Zurich Protocol noted that “[N]europsychologists are in the best position to interpret NP tests by virtue of their background and training...However, there may be situations where neuropsychologists are not available and other medical professional may perform or interpret NP screening tests.” The Zurich Protocol recommended that all high risk sports have formal baseline neuropsychological screening, stating “Although formal baseline NP screening may be beyond the resources of many sports or individuals, it is recommended that in all organised high risk sports consideration be given to having this cognitive evaluation regardless of the age or level of performance.” Finally, the Zurich Protocol noted that: “in the absence of NP and other testing, a more conservative return to play approach may be appropriate.”

127. The Zurich Protocol also expanded upon the sideline evaluation of concussion and formulated the SCAT2. The Zurich Protocol specifically stated:

- “When a player shows *any* features of a concussion:
- a. The player should be medically evaluated onsite using standard emergency management principles and particular attention should be given to excluding a cervical spine injury.
  - b. The appropriate disposition of the player must be determined by the treating healthcare provider in a timely manner. If no healthcare provider is available, the player should be safely removed from practice or play and urgent referral to a physician arranged.
  - c. Once the first aid issues are addressed, then an assessment of the concussive injury should be made using the SCAT2 or other similar tool.
  - d. The player should not be left alone following the injury and serial monitoring for deterioration is essential over the initial few hours following injury.
  - e. A player with diagnosed concussion should not be allowed to return to play on the day of injury. Occasionally in adult athletes, there may be return to play on the same day as the injury

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Sideline evaluation of cognitive function is an essential component in the assessment of this injury. Brief neuropsychological test batteries that assess attention and memory function have been shown to be practical and effective. Such tests include the Maddocks questions and the Standardized Assessment of Concussion (SAC). It is worth noting that standard orientation questions (eg, time, place, person) have been shown to be unreliable in the sporting situation when compared with memory assessment. It is recognised, however, that abbreviated testing paradigms are designed for rapid concussion screening on the sidelines and are not meant to replace comprehensive

neuropsychological testing which is sensitive to detect subtle deficits that may exist beyond the acute episode; nor should they be used as a stand-alone tool for the ongoing management of sports concussions. It should also be recognised that the appearance of symptoms might be delayed several hours following a concussive episode.”

(internal citations omitted).

128. The Zurich Protocol again emphasized the necessity of concussion education. “As the ability to treat or reduce the effects of concussive injury after the event is minimal, education of athletes, colleagues and the general public is a mainstay of progress in this field. Athletes, referees, administrators, parents, coaches and healthcare providers must be educated regarding the detection of concussion, its clinical features, assessment techniques and principles of safe return to play.”

129. Finally, the Zurich Protocol noted that there is no evidence that protective equipment, including helmets, will prevent concussion. “There is no good clinical evidence that currently available protective equipment will prevent concussion although mouthguards have a definite role in preventing dental and orofacial injury. Biomechanical studies have shown a reduction in impact forces to the brain with the use of head gear and helmets, but these findings have not been translated to show a reduction in concussion incidence.”

#### **6. In 2009, the “NFL Adopts Stricter Statement on Return to Play Following Concussions”**

130. In 2009, the NFL’s medical committee on concussions, in conjunction with team doctors, outside medical experts, and the NFL Players Association, adopted stricter standards of return to play decisions after concussions.<sup>74</sup>

131. The 2009 standards provided that a player who suffers a concussion should not return to play or practice on the same day if he shows any signs or symptoms of a concussion. The statement mandates:

“Once removed for the duration of the practice or game, the player should not be considered for return-to-football activities until he is fully asymptomatic, both at rest and after exertion, has a normal neurological examination, normal neuropsychological testing, and has been cleared to return both by his team physician(s) and the independent neurological consultant. These independent consultants have been approved by both the NFL Medical Advisor and the Medical Director of the NFL Players Association.

A critical element of managing concussions is candid reporting by players of their symptoms following an injury. Accordingly, players are to be encouraged to be candid with team medical staffs and fully disclose any signs or symptoms that may be associated with a concussion.”

132. The 2009 NFL standards stated that a player who suffers a concussion should not return to play or practice on the same day if any of the following symptoms are identified based on the initial medical evaluation of the player:

- “Loss of consciousness;
- Confusion as evidenced by disorientation to person, time or place; inability to respond appropriately to questions; or inability to remember assignments or plays;
- Amnesia as evidenced by a gap in memory for events occurring just prior to the injury inability to learn and retain new information; or a gap in memory for events that occurred after the injury;
- Abnormal neurological examination, such as abnormal pupillary response, persistent dizziness or vertigo, or abnormal balance on sideline testing;
- New and persistent headache, particularly if accompanied by photosensitivity, nausea, vomiting or dizziness;
- Any other persistent signs or symptoms of concussion.”

**7. In 2011, the NFL implemented a standardized concussion assessment protocol.**

133. In 2011, the NFL implemented standardized sideline concussion tests to be administered to injured athletes called the “NFL Sideline Concussion Assessment Protocol” and also a standardized baseline test.

134. The sideline protocol was apparently a result of a survey of team medical staffs and input from the players union and mirrors many aspects of the 2008 Zurich SCAT2 protocol. Notably, the NFL protocol was developed by its Head, Neck and Spine Committee, and specifically the return to play subcommittee which is chaired by Dr. Margot Putukian, who also consults to the NCAA.<sup>75</sup>

135. First, players must take a baseline test prior to the season. Once a player is injured, players must be evaluated with a standardized test “derived from the Standardized Concussion Assessment Tool 2 (SCAT2) and represents a standardized method of evaluating NFL players for concussion consistent with the reasonable, objective practice of the healthcare profession.” The protocol states that “If ANY significant abnormality is found, a conservative, ‘safety first’ approach should be adopted. An athlete suspected of sustaining a concussion is a ‘No Go’ and does not return to play in the same game or practice.” Moreover, the comparison is being done real-time in the NFL using iPad apps.<sup>76</sup>

136. The NFL explained: “The hope is that being able to compare the results of a baseline test and postinjury test side by side in real time will speed diagnosis and help doctors and trainers recognize when a player should be removed from a game. The league also plans to have independent neurological consultants on the sideline during each game to assist the team physician in diagnosing and treating players.”<sup>77</sup>

## **8. American College of Sports Medicine’s Concussion (Mild Traumatic Brain Injury) and the Team Physician: A Consensus Statement - 2011 Update**

137. The 2011 Update by the American College of Sports Medicine revised recommendations regarding mild traumatic brain injury from the 2006 edition.<sup>78</sup> The 2011 Update provided:

- “No same day return-to play (RTP).
- Neurological examination emphasizing cognitive function and balance.
- Role and limitations of neuropsychological (NP) testing.
- Utility of standardized baseline and postinjury assessments.
- Importance of preseason planning.
- Acknowledged importance of cognitive rest.
- Acknowledged emerging technologies and their role in concussion research.
- Recognition of long-term complications of concussion.
- Legislation and governing body regulations for concussion.”

138. In addition, the 2011 Update provided:

“It is **essential** the team physician understand:

- Before resuming exercise, the athlete must be asymptomatic or returned to baseline symptoms at rest and has no symptoms with cognitive effort.
  - Amnesia surrounding the event may be permanent.

- An athlete should no longer be taking medications that may mask or modify concussion symptoms.
- The athlete's clinical neurological examination (cognitive, cranial nerve, and balance testing) have returned to baseline before resuming exercise.
- If performed, NP testing returns to at-least baseline before resuming contact/collision activities.
- Progressive aerobic and resistance exercise challenge tests should be utilized before full RTP
  - This process may take days, weeks, or months.
  - Recurrence of symptoms and/or signs warrants additional rest and monitoring.
- Certain risk factors may affect RTP decision making.
- Additional factors may affect RTP decision making:
  - Risk-taking behaviors
  - Type of sport

It is ***desirable*** the team physician:

- Coordinate a team to implement sport-specific progressive aerobic and resistance exercise challenge tests before full RTP.
- Facilitate academic accommodations for symptomatic student athletes.
- Discuss status of athlete with parents/guardians, caregivers, certified athletic trainers, coaches, school officials, and others within disclosure regulations.”

(internal citations omitted) (emphasis in original).

139. The ACSM also published a 2012 Update.<sup>79</sup> Regarding “Establishing a Return to Play Process,” the 2012 Update states:

“Establishing a process for returning an athlete to play is the essential first step in deciding when an injured or ill athlete may safely return to practice or competition. This process should include evaluation of the athlete’s health status, participation risk, and extrinsic factors. The final RTP decision is made by the team physician.

It is essential the team physician:

- Understand the RTP process should be established during the off season.
- Coordinate a chain of command regarding decisions to return an injured or ill athlete to practice or competition.
- Evaluate the athlete's health status.
  - Medical factors including history, symptoms, signs, and additional tests.
  - Psychological factors, including readiness and coping mechanisms.
  - Functional testing to evaluate readiness to RTP.
  - Nature of the illness/injury including mechanism of injury, natural history, and known risks of participating after illness/injury.
- Evaluate the athlete's participation risk.
  - Demands of the athlete's sport, including the position and competitive level of play.
  - Role of taping, bracing, or orthoses to protect the athlete.
  - Role of medical interventions that allow an athlete to play (e.g., analgesics/injections, inhalers, and intravenous fluids).
  - RTP may affect other athletes (e.g., bracing, casting, and disease transmission).
- Understand extrinsic factors that may modify the acceptable level of risk (risk/gain ratio) for the individual athlete (e.g., pressure from parents, team and/or coaches, conflicts of interest and other ethical considerations, fear of litigation, point in athlete's season, or career).
- Communicate the RTP process to players, families, certified athletic trainers, coaches, administrators, and other health care providers.
- Confirm a system for medical documentation is in place.
- Establish protocols within disclosure regulations for the release of information regarding an athlete's ability to return to practice or competition after an injury or illness.
- Understand certain sports have governing body rules and regulations regarding participation that affect the RTP decision (e.g., no knee brace in rugby and skin infection in wrestling).
- Understand federal, state, and local regulations and legislation related to returning an injured or ill athlete to practice or competition.

It is desirable the team physician:

- Work with the athletic care network to educate athletes, parents, and coaches about the RTP process.
- Prepare a letter of understanding between the team physician and the administration that defines the authority, responsibilities, and RTP decisions.”

(internal citations omitted).

## **9. 2013 American Academy of Neurology Update**

140. On March 18, 2013, the American Academy of Neurology (“AAN”) replaced its 1997 practice parameter regarding sports concussion with the *Summary of Evidence-Based Guideline Update: Evaluation and Management of Concussion in Sports* (“AAN Update”).<sup>80</sup>

141. The AAN Update recommended the following diagnostic tools as useful in identifying those with concussion: Post-Concussion Symptom Scale or Graded Symptom Checklist; Standardized Assessment of Concussion; neuropsychological testing; Balance Error Scoring System; Sensory Organization Test; and these diagnostic measures used in combination.<sup>81</sup> With respect to neuropsychological testing, the AAN stated that such testing:

“generally require[s] a neuropsychologist for accurate interpretation, although [it] may be administered by a non-neuropsychologist. It is likely that neuropsychological testing of memory performance, reaction time, and speed of cognitive processing, regardless of whether administered by paper-and-pencil or computerized method, is useful in identifying the presence of concussion.”<sup>82</sup>

The AAN further stated that the above diagnostic tools may be used to identify athletes with “chronic neurobehavioral impairments.”<sup>83</sup>

142. The AAN also provided three sets of recommendations, regarding: (1) preparticipation counseling; (2) the assessment, diagnosis, and management of suspected concussion; and (3) the management of diagnosed concussion (including acute management, RTP, and retirement).<sup>84</sup>

143. First, with respect to preparticipation counseling, the AAN recommended that “school-based professionals be educated by experienced LHCPS [licensed healthcare providers] designated by their organization/institution to understand the risks of experiencing a concussion so that they may provide accurate information to parents and athletes.”<sup>85</sup>

144. Second, with respect to the management of diagnosed concussion, the AAN Update addressed RTP and the risk of recurrent concussion, and provided:

- “1. In order to diminish the risk of recurrent injury, individuals supervising athletes should prohibit an athlete with concussion from returning to play/practice (contact-risk activity) until an LCHP has judged that the concussion has resolved.
2. In order to diminish the risk of recurrent injury, individuals supervising athletes should prohibit an athlete with concussion from returning to play/practice (contact-risk activity) until the athlete is asymptomatic off medication.”<sup>86</sup>

145. The AAN also recommended “cognitive restructuring counseling” consisting of “education, reassurance, and reattribution of symptoms,” which has been shown to decrease the proportion of individuals with mTBI who develop chronic postconcussion syndrome.<sup>87</sup>

146. Finally, the AAN stated that licensed health care providers “should counsel athletes with a history of multiple concussions and subjective persistent neurobehavioral impairment about the risk factors for developing permanent or lasting neurobehavioral or cognitive impairments.”<sup>88</sup>

## **10. 2013 Zurich II Protocol**

147. The 4th International Conference on Concussion in Sport was held in Zurich in November 2012, resulting in an update of the Vienna, Prague and Zurich Protocols (“Zurich II”).<sup>89</sup> Zurich II provided just modest updates to the prior consensus guidelines.

148. With respect to pre-participation concussion management, Zurich II stated:<sup>90</sup>

Recognising the importance of a concussion history, and appreciating the fact that many athletes will not recognise all the concussions they may have suffered in the past, a detailed concussion history is of value. Such a history may preidentify athletes who fit into a high-risk category and provides an opportunity for the healthcare provider to educate the athlete in regard to the significance of concussive injury. A structured concussion history should include specific questions as to previous symptoms of a concussion and length of recovery; not just the perceived number of past concussions. It is also worth noting that dependence on the recall of concussive injuries by teammates or coaches has been demonstrated to be unreliable.

The clinical history should also include information about all previous head, face or cervical spine injuries as these may also have clinical relevance. It is worth emphasising that in the setting of maxillofacial and cervical spine injuries, coexistent concussive

injuries may be missed unless specifically assessed. Questions pertaining to disproportionate impact versus symptom severity matching may alert the clinician to a progressively increasing vulnerability to injury. As part of the clinical history, it is advised that details regarding protective equipment employed at the time of injury be sought, both for recent and remote injuries.

There is an additional and often unrecognised benefit of the preparticipation physical examination insofar as the evaluation allows for an educative opportunity with the player concerned as well as consideration of modification of playing behaviour if required.

149. Zurich II also emphasized the necessity of concussion education before a concussion has occurred, stating:<sup>91</sup>

“As the ability to treat or reduce the effects of concussive injury after the event is minimal, education of athletes, colleagues and the general public is a mainstay of progress in this field. Athletes, referees, administrators, parents, coaches and healthcare providers must be educated regarding the detection of concussion, its clinical features, assessment techniques and principles of safe return to play.”

150. In regards to “Same day RTP” after a concussion, Zurich II again reinforced:<sup>92</sup>

“It was unanimously agreed that no RTP on the day of concussive injury should occur. There are data demonstrating that at the collegiate and high school levels, athletes allowed to RTP on the same day may demonstrate NP deficits postinjury that may not be evident on the sidelines and are more likely to have delayed onset of symptoms.”

151. With respect to return to play, Zurich II stated: “The cornerstone of concussion management is physical and cognitive rest until symptoms resolve and then a graded programme of exertion prior to medical clearance and return to play.”<sup>93</sup> Zurich II further stated:<sup>94</sup>

“Return to play protocol following a concussion follows a stepwise process . . . With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. Generally, each step should take 24 h so that an athlete would take approximately one week to proceed through the full rehabilitation protocol once they are asymptomatic at rest and with provocative exercise. If any postconcussion symptoms occur while in the stepwise

programme, then the patient should drop back to the previous asymptomatic level and try to progress again after a further 24 h period of rest has passed.”

152. Zurich II included the following chart:<sup>95</sup>

Graduated Return-to-Play Protocol:

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Symptom limited physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum permitted heart rate No resistance training	Increase HR
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg, passing drills in football and ice hockey May start progressive resistance training	Exercise, coordination and cognitive load
5. Full-contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

153. Zurich II explained that a single return to play paradigm should be used for all athletes and that formal neuropsychological testing should be used in high risks sports regardless of age or level of competition, explaining:<sup>96</sup>

“All athletes regardless of level of participation should be managed using the same treatment and return to play paradigm. The available resources and expertise in concussion evaluation are of more importance in determining management than a separation between elite and non-elite athlete management. Although formal NP testing may be beyond the resources of many sports of individuals, it is recommended that, in all organised high-risk sports, consideration be given to having this cognitive evaluation, regardless of the age or level of performance.”

154. Zurich II also re-emphasized the importance of neuropsychological testing but noted that it should not be used as a stand-alone tool or form the sole basis of management decisions but rather as an aid to the clinical decision making process. In addition, Zurich II recommended that “all athletes should have a clinical neurological assessment (including assessment of their cognitive function) as part of their overall management,” and that NP testing should ideally be performed by trained neuropsychologists who are “in the best position to interpret NP tests by virtue of their background and training....”<sup>97</sup> Finally, Zurich II

recommended that all high risk sports, regardless of the age or level of performance, have formal baseline neuropsychological screening.<sup>98</sup>

155. The documents set forth above constitute the consensus best practices in the proper assessment and management of concussion for all physician, sub-specialty, and allied health professionals, including athletic trainers and those responsible for the safety, well-being and treatment of student-athletes.

## **IX. THE NCAA FAILED TO ADOPT GUIDELINES IN ACCORDANCE WITH THE CONSENSUS BEST PRACTICES**

### **A. Overview of NCAA Guidelines**

156. From 1994-1997, the NCAA published Guideline 2o, “Concussion and Second Impact Syndrome” in the NCAA Sports Medicine Handbooks.<sup>99</sup> From 1994-97, Guideline 2o included return to play guidelines, a concussion grading scale, and a sideline evaluation tool adopted from the Colorado Medical Society Guidelines for Management of Concussion in Sports. The NCAA removed the Colorado Medical Society Guidelines from its 1997-98 Handbook, citing “a lack of consensus among the medical community on management of concussions...”<sup>100</sup> The NCAA continued to repeat this reason as justification for its failure to adopt specific and mandated return to play guidelines.

157. In the 2004-05 NCAA Sports Medicine Handbook, the NCAA replaced Guideline 2o with Guideline 2i, entitled “Concussion or Mild Traumatic Brain Injury (mTBI) in the Athlete.” Guideline 2i was not significantly revised again until the 2010-2011 edition.

158. In 2010, the NCAA implemented Concussion Management Plan Legislation and updated Guideline 2i in its Sports Medicine Handbook. The NCAA legislation required member schools to have a Concussion Management Plan (“CMP”) in place for all sports. The NCAA Sports Medicine Handbook Guideline 2i was also revised in 2010 to recommend “Best Practices for a Concussion Management Plan.”<sup>101</sup> The NCAA does not audit member institution concussion management plans,<sup>102</sup> nor requires schools to adopt the recommended practices.

159. Based on my review of the materials listed in Appendix C, as well as my professional research, and clinical experience of managing sports-related concussion, the NCAA’s failure to mandate a Concussion Management Plan for all institutions, in accordance with the consensus best practices, demonstrated inadequate and substandard conduct in the management of student athletes’ concussions. The NCAA did not exercise, nor require its member institutions to exercise, the ordinary and reasonable care that would be expected in the care of student-athletes that suffer concussions, given the undertakings the NCAA made regarding the safety of student athletes.

160. As I will outline below, there are several areas that reflect the NCAA's failure to provide or require Concussion Management Plans that satisfied the consensus best practices. I will now review these critical failures in concussion management.

161. In assessing the NCAA's responsibility it must be noted that the NCAA has been studying safety issues for "20 years." The NCAA is in a superior position than student athletes with respect to concussion issues.

162. In assessing its duty of care, I also take into account the disparity between the power of the NCAA and that of the student athlete. Student athletes are often not going to risk losing their position and playing time by reporting symptoms and are reluctant to risk the wrath of a powerful coach. This makes it all the more important that the NCAA be vigilant in its promulgation of a Concussion Management Plan.

## **B. How the NCAA Failed to Provide a Safe Environment with Regard to Concussion Management**

### **1. The NCAA failed to require member institutions to follow a concussion management plan that complied with the consensus best practices**

#### **a. Prior to 2010**

163. Despite publication of the Vienna and Zurich Protocols, the NCAA did not modify or revise its Guideline 2i in the 2009-10 Handbook – but rather repeated Guideline 2i which had not been substantially modified since 2004-05. The NCAA did not adopt the internationally accepted guidelines set forth in 2002 in the Vienna Protocol, reaffirmed and explained in the 2005 Prague Protocol and expounded upon again in the 2009 Zurich Protocol. In fact, the NCAA continued to repeat its dismissal of the International Consensus Protocols:<sup>103</sup>

"More recent grading systems have been published which attempt to take into account the expanding research in the field of mTBI in athletes. Though useful to become familiar with these guidelines, it is important to remember that many of these injuries are best treated in an individual fashion (Cantu '01, Vienna Conference, NATA '04)."

164. In comparison to the Zurich Protocol and other guidelines and publications of the time period the 2004-05 through the 2009-10 Handbooks failed to:

- "Adopt the 24 hour stepwise return to play guidelines;
- Acknowledge that a day is needed between return to play steps and that typically a week of asymptomatic time is needed to

resolve symptoms relating to a concussion prior to return to play;

- Acknowledge that if any symptoms occur after concussion, the patient should drop back to the previous asymptomatic level and try to progress again after 24 hours;
- State the complete importance of neuropsychological and baseline testing;
- Recommend or mandate baseline testing especially for high risk sports;
- Note that, in the absence of neuropsychological testing and formal balance assessment, a more conservative return to play approach may be appropriate;
- Note that neuropsychologists are in the best position to interpret NP tests and where neuropsychologists are not available, other medical professionals may perform or interpret NP screening tests;
- Recommend, mandate or implement a standardized sideline concussion evaluation process;
- Recommend, mandate or implement the usage of a standardized sideline concussion assessment tool (eg, SCAT2)
- Acknowledge that the appearance of symptoms might be delayed several hours following a concussive episode;
- Take into account the education of athletes and others regarding concussion;
- Acknowledge that rule changes may be necessary;
- Acknowledge the importance of rule enforcement;
- Acknowledge risk compensation in athletes;
- Acknowledge that protective equipment does not prevent concussion.”

165. Guideline 2i in the 2004-05, 2005-06 and 2006-07 Handbooks stated in pertinent part:<sup>104</sup>

“There are several grading systems and return to play guidelines in the literature regarding concussion in sport (AAN, Torg, Cantu). However, there may be limitations because they presume that LOC is associated with more severe injuries. It has been demonstrated that LOC does not correlate with severity of injury in patients presenting to an emergency department with closed head injury, and has also been demonstrated in athletes with concussion.

(Lovell '99). It has been further demonstrated that retrograde amnesia (RGA), post traumatic amnesia (PTA), as well as the duration of confusion & mental status changes greater than 5 minutes may be more sensitive indicators of injury severity (Collins '03). More recent grading systems have been published which attempt to take into account the expanding research in the field of mTBI in athletes. Though it is useful to become familiar with these guidelines, it is important to remember that many of these injuries are best treated in an individual fashion (Cantu '01, Vienna Conference, NATA '04)."

166. The NCAA outright dismissed the Vienna Protocol in Guideline 2i, claiming that return to play guidelines remained "controversial":

"Given these limitations, it is essential that the medical care team taking care of athletes continue to rely on their clinical skills in evaluating the head injured athlete to the best of their ability. It is essential that no athlete be allowed to return to participation when any symptoms, including mild headache, persist. It has also been recommended that for any injury which involves significant symptoms, long duration of symptoms, or difficulties with memory function (either retrograde or antegrade) not be allowed to return to play during the same day of competition. ***The duration of time that an athlete should be kept out of physical activity is unclear, and in most instances, individualized return to play decisions should be made.*** These decisions will often depend on the clinical symptoms, as well as previous history of concussion, and severity of previous concussions. Additional factors include the sport, position, age, support system for the athlete, and the overall "readiness" of the athlete to return to sport. Once an athlete is completely asymptomatic the return to play progression should occur in a stepwise fashion with gradual increments in physical exertion and risk of contact. After a period of remaining asymptomatic, the first step is an "exertional challenge" where the athlete exercises for 15-20 minutes in an activity such as biking or running where they increase their heart rate and break a sweat. If they do not experience any symptoms, this can be followed by a steady increase in exertion, followed by return to sport-specific activities that do not put the athlete at risk for contact. Examples include dribbling a ball or shooting, stickwork or passing, or other agilities. This allows the athlete to return to the practice setting

albeit in a limited role. Finally, the athlete can be progressed to practice activities with limited then full contact and finally full contact. How quickly one moves through this progression remains controversial.”

(Emphasis supplied.) Therefore, in revised Guideline 2i, the NCAA *still* failed to adopt or endorse a specific return to play protocol despite the consensus reached in Vienna. Moreover, the NCAA ignored the consensus reflected in the Vienna Protocol, which provided that each step in the return to play protocol may take a minimum of one day, depending on the duration of symptoms, and that progression through each step may take longer in individual circumstances. Guideline 2i did not mention the 24-hour guideline.

167. In addition, the Vienna Protocol provided that if any symptoms occur after exertion, the patient should drop back to the previous asymptomatic level and try to progress again after 24 hours. Meanwhile, the 2004-05, 2005-06, and 2006-07 NCAA Handbooks make no mention of a minimum one day per step in a return to play protocol and also make no mention of that the fact that an athlete may need to drop back to a previous asymptomatic level and try to progress again after 24 hours if there is an additional set back.

168. Further, while the 2004-05, 2005-06 and 2006-07 NCAA Handbooks finally mentioned developments in neuropsychological testing as providing “a reliable assessment and quantification of brain function,” they also contradictorily stated that “[D]espite the utility of neuropsychological test batteries in the assessment and treatment of concussion in athletes, several questions remain unanswered. Further research is needed to understand the complete role of neuropsychological testing. Given these limitations, it is essential that the medical care team treating athletes continue to rely on its clinical skills in evaluating the head-injured athlete to the best of its ability.”<sup>105</sup> Therefore, while the Handbooks acknowledge the benefits of neuropsychological testing on one hand, they provide almost no information or guidance regarding their use. Rather than providing or recommending examples of tests or suggestions for effective use of neuropsychological testing (like in the Vienna Protocol), the Handbooks instead focused on the limitations of neuropsychological testing and encouraged medical teams to not rely on them but rather rely on “its clinical skills in evaluating the head injured athlete to the best of its ability.”<sup>106</sup> This rejection of the use of neuropsychological testing is inconsistent with the consensus best practices.

169. Finally, the Handbooks make no mention of concussion education techniques for coaches, trainers, students or parents despite being identified in the Vienna Protocol as a “mainstay of progress in the field.”<sup>107</sup>

170. The NCAA’s Director of Health and Safety, David Klossner, has also recognized the commonality of the concussion injury and the effect of the NCAA’s policy of failing to educate student-athletes, athletic trainers and team physicians:<sup>108</sup>

**NCAA Issues:**

- College age athlete difficult to manage; many freshman closer to adolescent than adult.
- College age athletes often minimize symptoms and/or under-report their injuries; they often feel immortal, and may not understand the consequences of playing with injury.
- Economics seem to be playing a role in care and coverage
- Variety of member institutions with very different resources available to them; may not have access to ATC staff, team physicians, additional testing tools (neuropsych)
- Despite the significance and commonality of this injury, a significant number of athletic trainers and team physicians are not up to date when it comes to concussion

171. Klossner also recognized that the Zurich Protocol reflected consensus best practices among the scientific community:<sup>109</sup>

Care and Return-to-Play. The science of concussion is evolving and therefore management and return to play decisions remain in the realm of clinical judgment on an individualized basis. The Sports Medicine handbook guideline provides an overview of the topic and reference from which institutions can refer for more detailed guidelines. The most recent consensus document on the topic of prevention, identification, care and return to play are the Zurich Consensus statement.

172. I agree with David Klossner that the science of concussion is evolving. That really is of no moment. All science evolves. He is incorrect however to suggest that the consensus on return to play was that it was an “individualized decision.” Yes, every patient must be examined. But that examination should, in the context of the NCAA, have been undertaken with a uniform Concussion Management Plan followed by all institutions. That plan should have adopted the consensus document that Mr. Klossner refers to and the other consensus documents previously cited.

**b. The 2010 legislation does not remedy this failure**

173. While the NCAA’s 2010 legislation is a step in the right direction it does not remedy the problem. I believe it is a mistake to leave specific details of the Concussion Management Plan up to individual schools. Rather consensus best practices should have been mandated by the NCAA. Without consensus best practices, for example, powerful football coaches who earn many times the salary of a college president wield far more power than is appropriate. Athletes can be easily intimidated by coaches. An athlete is largely left without an advocate and no power in regards to an injury. If a coach tells him to keep playing, he risks being removed from the team if he confronts the coach.

**2. The NCAA’s failure to require a CMP incorporating a stepwise return to play protocol was inconsistent with consensus best practices**

174. Consensus was reached in 2002 – and reinforced with each subsequent International Consensus Statement – that athletes suffering concussion symptoms should never

be returned to play in the same game, and that coaches, players, trainers and physicians should follow a systematic return to play policy that includes systematic and graded return to exertion following injury, systematic reevaluation of symptoms following each exertional state, and a collective understanding that the patient is completely asymptomatic at rest, asymptomatic with exertion, and has intact neurocognitive performance prior to final clearance. Across all aspects of these consensus best practices, it is clear that the NCAA failed to require (much less explain), an appropriate concussion management plan.

175. Moreover, the 2004 NATA Position Statement provides that the “philosophy for managing sport-related concussion [should be set] before the start of the athletic season.” “After deciding on an approach, the ATC-physician team should be consistent in its use regardless of the athlete, sport, or circumstances surrounding the injury.” Thus, the NCAA’s failure to implement an organized approach at assuring a safe return to competition for student athletes was contrary to the consensus best practices. The NCAA cannot find a safe haven in individualized medical issues because appropriate return to play guidelines should be used consistently “regardless of the athlete, sport, or circumstances surrounding the injury.”

176. The NCAA failed to implement or require the implementation of the consensus set forth in the Vienna Protocol – and updated with the Prague and Zurich Protocols. The Vienna Protocol recommended specific return to play guidelines that continue to be followed today:

“When a player shows ANY symptoms or signs of a concussion:

- (1) The player should not be allowed to return to play in the current game or practice.
- (2) The player should not be left alone; and regular monitoring for deterioration is essential.
- (3) The player should be medically evaluated after the injury.

Return to play must follow a medically supervised stepwise process. A player should never return to play while symptomatic.  
‘When in doubt, sit them out!’”

177. The Vienna Protocol also recommended a return to play stepwise process as follows:

“It was the consensus of the CISG that a structured and supervised concussion rehabilitation protocol is conducive to optimal injury recovery and safe and successful return to play. The rehabilitation principles were common to all identified programmes and are outlined below. Important principles state that the athlete be

completely asymptomatic and have normal neurological and cognitive evaluations before the start of the rehabilitation programme. Therefore, the more prolonged the symptom duration, the longer the athlete will have sat out. The athlete will then proceed stepwise with gradual incremental increases in exercise duration and intensity, and pause or backtrack with any recurrence of concussive symptoms. It is appreciated that, although each step may take a minimum of one day, depending on the duration of symptoms, proceeding through each step may take longer in individual circumstances.”

178. The Vienna Protocol also provides that return to play after a concussion follows a stepwise process:

- “(1) No activity, complete rest. Once asymptomatic, proceed to level
- (2) Light aerobic exercise such as walking or stationary cycling.
- (3) Sport specific training - for example, skating in hockey, running in soccer.
- (4) Non-contact training drills.
- (5) Full contact training after medical clearance.
- (6) Game play.

With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. If any symptoms occur after concussion, the patient should drop back to the previous asymptomatic level and try to progress again after 24 hours.”

179. The NCAA’s failure to implement this organized approach to the care of student athletes, or to require its member institutions to implement an organized approach, was against consensus best practices.

**3. Prior to 2010, the NCAA’s failure to require that student athletes’ concussions be managed by medical personnel with specific expertise in concussion diagnosis, treatment, and management was inconsistent with consensus best practices**

180. The 2004 NATA Position Statement requires that an athletic trainer or team physician should monitor an athlete with a concussion at 5-minute intervals from the time of the injury until the athlete's condition completely clears or the athlete is referred for further care. The 2004 NATA Position Statement also provides that an athletic trainer is supposed to refer the

athlete to a physician on the day of the injury if the athlete experienced any of the following symptoms:

<p>Day-of-injury referral</p> <ul style="list-style-type: none"> <li>1. Loss of consciousness on the field</li> <li>2. Amnesia lasting longer than 15 min</li> <li>3. Deterioration of neurologic function*</li> <li>4. Decreasing level of consciousness*</li> <li>5. Decrease or irregularity in respirations*</li> <li>6. Decrease or irregularity in pulse*</li> <li>7. Increase in blood pressure</li> <li>8. Unequal, dilated, or unreactive pupils*</li> <li>9. Cranial nerve deficits</li> <li>10. Any signs or symptoms of associated injuries, spine or skull fracture, or bleeding*</li> <li>11. Mental status changes: lethargy, difficulty maintaining arousal, confusion, or agitation*</li> <li>12. Seizure activity*</li> <li>13. Vomiting</li> </ul>	<ul style="list-style-type: none"> <li>14. Motor deficits subsequent to initial on-field assessment</li> <li>15. Sensory deficits subsequent to initial on-field assessment</li> <li>16. Balance deficits subsequent to initial on-field assessment</li> <li>17. Cranial nerve deficits subsequent to initial on-field assessment</li> <li>18. Postconcussion symptoms that worsen</li> <li>19. Additional postconcussion symptoms as compared with those on the field</li> <li>20. Athlete is still symptomatic at the end of the game (especially at high school level)</li> </ul>
<p>Delayed referral (after the day of injury)</p> <ul style="list-style-type: none"> <li>1. Any of the findings in the day-of-injury referral category</li> <li>2. Postconcussion symptoms worsen or do not improve over time</li> <li>3. Increase in the number of postconcussion symptoms reported</li> <li>4. Postconcussion symptoms begin to interfere with the athlete's daily activities (ie, sleep disturbances or cognitive difficulties)</li> </ul>	

\*Requires that the athlete be transported immediately to the nearest emergency department.

181. Yet, the NCAA did not require that all teams have physicians or that referrals to physicians be made. The NCAA's failure to require physician involvement and that an athlete with concussion symptoms be seen by medical personnel who are experienced in concussion was not in accordance with the generally accepted standards in the industry.

182. Leaving discretion of return to play for a student-athlete that had suffered a concussion or displayed concussion symptoms to an individual member institution's "medical staff" without regard to whether the staff included physicians or personnel with specific expertise in concussion diagnosis, treatment, and management is against consensus best practices.

183. For example, Plaintiff Derek Owens complained after a game, in which he sustained a hard hit to the head on a punt return, to student athletic trainers that he had a headache. Rather than inquire further into his symptoms (which he described as a throbbing head, pressure in his head, his head felt like it had swelled in size, and ringing in his ears), the student athletic trainers just gave him some pills, failed to document the complaints or treatment, and failed to refer him for immediate assessment and/or follow-up to the head athletic trainer or physician. Trainers and physicians skilled in the management of concussion should recognize that a headache after a hit to the head (and the other symptoms Owens described) is a warning sign of concussion that requires further neuropsychological and neurocognitive assessment and the player need be fully asymptomatic before returning to play even at practice. Owens'

situation would have been, or should have been, handled differently and in accord with generally-accepted consensus best practices, had the NCAA mandated he – and all other student-athletes with concussion symptoms – be seen by physicians or personnel with specific expertise in concussion diagnosis, treatment, and management.

**4. The NCAA’s failure to require formal baseline and/or post-injury neurocognitive testing was a violation of the consensus best practices**

184. The International Consensus Statements provide that neuropsychological testing is one of the “cornerstones” of appropriate concussion management and contributes significantly to both understanding the injury and management of the individual.

185. The computerized exams are a snapshot of how a healthy brain functions with different tests for different sections of the brain. They serve as a reference point or, in the vernacular of concussion management, a baseline. When a student-athlete has a concussion, the baseline will provide the physician with a background in treating concussions with critical information with which to manage the injury. While the computerized testing measures the brain’s cognitive skills (the ability to think), baseline testing should also include balance and vision testing.

186. Neuropsychological testing is especially critical in student-athletes because they may have a proclivity to minimize symptoms – whether because of pressure from a coach, to save their spot on the roster, or to protect their scholarship. Even when a student athlete states that their symptoms are gone, neuropsychological testing will demonstrate whether their cognitive abilities, balance and vision have returned to pre-injury levels.

187. The NCAA’s failure to require formal baseline testing was against consensus best practices. Without a formal baseline, it is very difficult for a physician to determine when a patient has recovered. And returning a student-athlete to play before they are fully recovered negligently puts them at risk for permanent brain injury. There is not a single good reason for not requiring all student-athletes to undergo baseline testing.

**5. The NCAA’s failure to require concussion education for student-athletes was inconsistent with consensus best practices**

188. The NCAA did not meet its obligation to educate student-athletes regarding the risks of catastrophic injury in sports. The NCAA did not take any steps to ensure student-athletes knew, understood and appreciated the risks. These warnings should be given and the adequacy of their content provable at a later date. Here, the NCAA failed to provide the education regarding concussions to student athletes that met its duty of care and consensus best practices .

189. Since the first International Consensus Statement (Vienna) in 2001, experts agree that providing education to athletes and those working with them is “a mainstay of progress in this field.” The Vienna Protocol provides: “Athletes and their healthcare providers must be taught how to detect concussion, its clinical features, assessment techniques, and principles of safe return to play. Methods to improve education including various web based resources (for example, [www.concussionsafety.com](http://www.concussionsafety.com)), educational videos, outreach programmes, concussion working groups, and the support and endorsement of enlightened sport groups such as FIFA, IOC, and IIHF who initiated this endeavour have enormous value and must be pursued vigorously.”

190. Despite this consensus that education must be provided to athletes about concussion detection, its clinical features, assessment techniques, and safe return to play, the NCAA did not require that athletes be educated until, at the earliest, 2010. Even at that time however, the NCAA’s actions fell far short of the standards.

191. In 2010, the NCAA agreed that concussion education is a critical component of concussion management. Ron Courson, the Director of Sports Medicine at University of Georgia and a member of the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports (CCSMAS) testified before Congress: “Concussion education and research may be our most important undertaking. We must educate not only athletes, but parents, coaches and health care professionals.” He also testified: “Further educational initiatives are needed in concussion management.”<sup>110</sup>

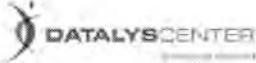
192. While the International Consensus groups have contemplated since 2001 that concussion education for student-athletes should be fulsome, and incorporate a full panoply of tools including video, the NCAA has not followed suit.

193. For the first time in 2010, the NCAA’s Health and Safety Group developed a one-page Concussion Fact Sheet for student-athletes (incorporated in this report above). But, in the drafting process, the NCAA Health and Safety Group deleted the statement that a concussion “[c]an end your season, impact your GPA, and have long-term life consequences.”<sup>111</sup> The final Concussion Fact Sheet provided no warning to students regarding immediate or the long-term consequences from concussions.<sup>112</sup> Moreover, this fact sheet was the only education the NCAA undertook – and it only provided each campus with two posters and two sets of fact sheets addressing concussion awareness for student-athletes and coaches.<sup>113</sup>

194. Thus, in my opinion – just as reflected in the statements of other NCAA employees and CCSMAS members – students, coaches, athletic trainers and physicians continue to lack the education and knowledge they need regarding concussions.<sup>114/115/116</sup> In my opinion, this lack of education within the NCAA has been in contravention of its duty of care and consensus best practices since 2002.

## 6. Internal documents demonstrate the NCAA's failure to adequately address concussion issues

195. A NCAA Concussion Summit was held on April 9, 2010. At the Summit, the NCAA made a full presentation to spark discussion. First, it opened the presentation with a discussion of estimated concussion rates at NCAA schools:<sup>117</sup>



Concussions in NCAA from 2004-2009					
% of Injuries Competition	Median Days Out	Injury Frequency Rank	12 most common injury Rank	National 5-yr Estimate (concussion)	Comments
Football	6.6	6	4	2	more concussions than all other fall sports combined
W. Soccer	10.7	6	2	5,751	Mech. simliar to M. Soccer
M. Soccer	6.2	6	4	3,374	nealy 1/3 due to direct player contact while heading ball
W. Volleyball	3.9	6	7	1209	
W. Basketball	6.8	5	4	827	
W. Field Hockey	8.7	4	7	685	
M. Basketball	4.3	4	6	664	
Wrestling	4.5	8	5	256	
W. Ice Hockey	12.6	6	4	154	
W. Gymnastics	2.3	9	11	28	
Sport 5-yr Concussion Estimate					29,225
Per year					2,923

[NCAA.org/Issues/Safety](http://NCAA.org/Issues/Safety)



196. During the discussion on this topic, participants “note[d] high rates in women’s sports behind football as the highest” and asked “Can we look at this on a year-to-year basis – eg women’s basketball?”<sup>118</sup>

197. The NCAA also presented the preliminary results of a survey tracking how concussions were managed at member schools. The NCAA sent a survey to the Head Athletics Trainers at all schools and received 512 responses (48%).<sup>119</sup> The NCAA presented the following results. As to each result I explain why the result indicates that the NCAA has failed to provide a “safe” environment for its student athletes and/or failed to meet the consensus for CMP:

- **Result Presented:** 66% of the schools performed some form of baseline testing for some sports.<sup>120</sup> *[In my opinion all schools should perform baseline testing for all concussion prone sports.]*

- **Result Presented:** For the 172 schools that did not require a baseline concussion assessment on their student-athletes, they responded that the following factors contributed to their decision: cost (70%), inconvenience (20%), too time consuming (48%), lack of qualified clinicians to administer (34%), not enough evidence showing utility of test (21%), as well as “a lack of support from coaches/administrators.”<sup>121</sup>  
*[In my opinion all schools should perform baseline testing for all concussion sports. The cost is minimal when compared to the risk to the student athlete of being returned to play before returning to baseline levels; without a baseline test, treatment of the student athlete is much more difficult and uncertain.]*
- **Result Presented:** Less than 50% of all schools confirmed that “a physician is required to see all student-athletes with a concussion.” (Emphasis in original.)<sup>122</sup> *[In my opinion, all schools should have a physician see such athletes. My opinion is confirmed by the 2004 NATA Position Statement which requires referral to a physician when enumerated symptoms are present.]*
- **Result Presented:** “Overall, 39% of respondents indicated their institution does not have an established return to play guidelines.” (emphasis in original).<sup>123</sup> **Related Discussion:** The Summit participants discussed that even for those schools that have return to play guidelines, “[m]any are following old guidelines.”<sup>124</sup> They also discussed that the NCAA “[n]eed[s] mandates in place for minimum protocol, to avoid litigation, even if it doesn’t pick up what’s going on which the kid or impact the kids medical outcome. And following a strict protocol may raise some more questions (open up doors) that lead to something that would identify concussion.” (Emphasis in original)<sup>125</sup> Also, the “First mandate – a written protocol in place that everyone understands.” (Emphasis in original.)<sup>126</sup>  
*[In my opinion all schools must have consistent return to play guidelines that must be followed regardless of the athlete or sport.]*

- **Result Presented:** “[N]early one-half also responded that they will allow a student-athlete to return-to-play in the same game after a concussion diagnosis.” (Emphasis in original.)<sup>127</sup> The NCAA presented the following chart reflecting these findings:

### Return-to-Play (cont.)

- In spite of the majority of institutions indicating they have a required waiting period prior to returning to play, nearly one-half also responded that they will allow a student-athlete to return-to-play in the same game after a concussion diagnosis. There were no significant divisional differences.

Depends on the sport	6%
Anytime when symptoms are less severe	1%
Anytime as long as all symptoms have resided	7%
After 15 minutes and all symptoms have resided	33%
Never same game	19%
Never same day	34%

- The majority of respondents indicated they believe medical staff (ATCs and team physicians) have positional authority for withholding student-athletes from return-to-play without negative impact in all cases (91%). Another 7% believed they have this authority in some cases, while just 1% believe they never have this authority without fear of negative impact.



*[It is my opinion, that a student athlete must never be returned to play on the same day after a concussion diagnosis.]*

**Result Presented:** With respect to a physician-directed concussion management plan, 26% of the schools did not have one and 50% had one but did not require that it be presented annually to the medical staff and coaches.<sup>128</sup>

- **Result Presented:** “With the exception of ATCs [athletic trainers], the majority of institutions reported not having required education in the past two years on concussion management for others in the athletics department.”<sup>129</sup> *[In my opinion concussion management education should be mandatory and done annually.]*
- **Result Presented:** Just 13% of all student-athletes and 17% of student-athletes in high risk sports had “been required to receive” concussion management education in the past two years.<sup>130</sup> **Related Discussion:** Yet Summit

participants discussed that “We are responsible for educating them, and the s-a is responsible for reporting.”<sup>131</sup>

***[In my opinion concussion management education should be mandatory and done annually.]***

- **Result Presented:** Just 24% of all coaches and 17% of coaches in high risk sports had “been required to receive” concussion management education in the past two years.<sup>132</sup>

***[In my opinion concussion management education should be mandatory and done annually.]***

- **Result Presented:** Just 15% of campus health care nurses had “been required to receive” concussion management education in the past two years.<sup>133</sup> ***[In my opinion concussion management education should be mandatory and done annually.]***

198. The NCAA identified the following challenges at the Summit for which it sought solutions:



- Removal and referral in practice and competitions
- State and Federal Laws, NFL and NFHS Rules create new standards
- Lack of Physician involvement
- Equitable access to ATCs for assessment across divisions
- Many allow same game return-to-play
- Athlete may not be aware of symptoms or do not report them to avoid being removed
- Sports Medicine staff not up to date on concussion management
- Pressure from coaches to keep player in
- Short term emergent care & long term post traumatic consequences

**7. The Ivy League schools move closer to a proper CMP and a minimum CMP that the NCAA should make all schools follow.**

199. Beginning with the 2011 season, the Ivy League Presidents accepted a series of recommendations made by a special ad hoc committee with the goal of lowering the incidence of concussion and subconcussive hits in football.<sup>134</sup> The Ivy League subsequently issued a report with their findings and recommendations.

200. The recommendations, “include limits to the number of full-pad/contact practices that can take place throughout the football year” and provide “further emphasis on educating student-athletes on proper tackling technique, the signs and symptoms of concussion, and the potential short and long-term ramifications of repetitive brain trauma” in addition to “more stringent post-game League review of helmet to helmet and targeted hits.”

201. The report and recommendations were a response to research suggesting that concussions “not only have acute consequences but also more long-term sequelae.” Specifically, the multiple hits sustained in football may have a role in the development of CTE in some individuals.

202. In addition, the Ivy League highlighted the need for academic accommodations after concussive injury as “extremely critical” because cognitive and physical rest are essential aspects of the recovery process. The Ivy League recommended that Ivy League Presidents communicate with the deans at each campus to ensure that they were aware of the need for appropriate academic accommodations for concussed athletes.

203. The Ivy League, in an effort to reduce the overall number of opportunities for helmet or head collisions, limited in season contact practices to two full contact days per week (a 60% reduction from the NCAA limit).<sup>135</sup> In addition, they reduced spring practice by one in the number of allowable full contact practices (a 12% reduction from the NCAA limit). For preseason, they limited to one the number of days that pads can be worn during both sessions of two-a-days during the preseason and also called for “greater time and attention devoted to the teaching of and emphasis on proper techniques for avoiding helmet hits.” In addition, “officials will be directed to continue erring on the side of caution by calling penalties if a helmet...hit might have occurred, which will in turn allow the Ivy League office to assess and determine any appropriate postgame ramifications.”

204. In regards to education, the Ivy League recommended the following:

- Continue providing educational information to student-athletes summarizing the signs and symptoms of a concussion, and emphasizing the potential long term risks of repetitive brain trauma and the need to report and not play with any symptoms of a concussion.
- Practices will continue to include and will emphasize and enhance the teaching of proper football fundamentals and technique to avoid leading with the head, including a de-emphasis of this on defenseless players.
- Teams should view, at least annually, educational videos regarding concussion in sports (e.g., existing NFL and NCAA

videos) and videos of specific examples of legal and illegal football hits provided by the NCAA.

- Each team should conduct an additional in person, annual educational session aimed at connecting directly with the student athletes by involving individuals personally knowledgeable about concussions (*e.g.*, former student athletes, researchers, athletics trainers, team physicians).
- The annual officials' clinic conducted by the Ivy League Coordinator of Football Officials will include a session on concussion information.

205. Finally, the Ivy League athletic trainers and team physicians developed "specific return to play guidelines for use after a concussion diagnosis, incorporating NCAA best practices and supported by all eight schools." Unlike the NCAA, the Ivy League adopted the Zurich Protocol's RTP guidelines.<sup>136</sup>

## **X. THE NCAA AND PLAINTIFFS' SCHOOLS VIOLATED THE CONSENSUS BEST PRACTICES WITH RESPECT TO PLAINTIFFS**

### **A. Summary**

206. The NCAA and Plaintiffs' schools violated the consensus best practices with respect to the education about, prevention of, and management of concussions in student-athletes, including in one or more of the following ways:

#### **1. Until 2010, the NCAA failed to maintain or require, and the schools thus failed to maintain, a written protocol on concussion management against consensus best practices**

207. According to the Vienna Statement, a structured and supervised concussion protocol is conducive to optimal recovery and safe and successful return to play following cerebral concussion. The NATA Position Statement also reports the need for specific protocols and a "team approach" to the assessment of concussion. This document outlines that a philosophy for managing sports-related concussion must be agreed to and implemented before the start of the athletic season.

208. Here, neither the NCAA nor the Plaintiffs' Schools maintained a written protocol on concussion management. The failure to maintain a written protocol contributed to Plaintiffs' injuries described below.

**2. The NCAA failed to provide student-athletes with catastrophic injury risk education**

209. The NCAA did not meet its obligation to educate student-athletes regarding the risks of catastrophic injury in sports. The NCAA did not take any steps to ensure student-athletes knew, understood and appreciated the risks. These warnings should be given and the adequacy of their content provable at a later date. Here, neither the NCAA nor the Plaintiffs' Schools provided the education regarding concussions to Plaintiffs that met the consensus best practices. This failure contributed to Plaintiffs' injuries.

**3. The NCAA failed to implement appropriate baseline concussion testing**

210. The consensus best practices require baseline testing prior to a student-athlete playing each season.<sup>137</sup> With baseline testing the athletes are given each of the tests in the pre-season before an injury occurs. This represents their "baseline" or normal score. Once an athlete sustains a concussion he/she is given the tests again and a comparison is made to see if the athlete has returned to baseline or their pre-injury levels.

211. Moreover, one component of baseline testing is computerized neuropsychological testing, which is a "cornerstone" of concussion evaluation. The NCAA's failure to require some form of neuropsychological testing as part of the concussion management protocol was a deviation from the consensus best practices..

212. The NCAA did not mandate, and none of the Plaintiffs was provided, full baseline testing at the outset of their NCAA careers or before each season. This inaction places the athlete at greater risk of often returned to play without having fully recovered from a concussion. This in turn places the athlete at risk of second impact syndrome and post concussion syndrome.

213. The NCAA's failure was against consensus best practices and contributed to Plaintiffs' injuries as described below because the schools had no ability to determine whether the Plaintiffs were ready to return to play following each of their multiple concussions. Moreover, to the extent computerized neuropsychological testing was used at the schools, it was not interpreted by a neuropsychologist nor consistently re-tested post-injury.

**4. The NCAA failed to require a stepwise return to play protocol**

214. The NCAA failed to implement or require the implementation of medically-supervised stepwise return to play criteria with express time requirements for the student-athlete who was concussed or displayed concussion symptoms to be asymptomatic. The failure of the NCAA (and Plaintiffs' Schools) to require a medically-supervised return to play program with express time requirements was against consensus best practices and caused Plaintiffs' injuries as described below.

**5. The NCAA failed to require that student-athletes who suffered a concussion or displayed concussion symptoms be managed by medical personnel with specific expertise in concussion diagnosis, treatment, and management.**

215. The NCAA failed to require that student-athletes who suffered a concussion or displayed symptoms of a concussion not be left alone and that medical personnel with specific expertise in concussion diagnosis, treatment, and management regularly monitor the student-athlete for deterioration. Each of the Plaintiffs was left alone after suffering concussions in violation of the consensus best practices on concussion management. Moreover, none of the Plaintiffs was treated by medical personnel with specific expertise in concussion diagnosis, treatment and management until their injuries were extensive – and then only when they specifically sought out the treatment. This was a clear violation of the consensus best practices.

**6. The NCAA failed to require adequate documentation of concussion incidents**

216. To compound the problems, neither the NCAA nor the schools maintained documentation of the initial assessment, successive follow-up evaluations and documentation regarding referrals and return to play decisions. Documentation is one area that is emphasized by NATA. The NATA Position Statement states that all pertinent information surrounding any concussive injury should be explicitly documented in writing, including mechanism of injury, initial signs and symptoms, state of consciousness, findings on serial testing of symptoms, neuropsychological function, and postural stability tests. The NATA Position Statement further instructs the athletic trainer to give written instructions to the athlete and/or parents regarding management of injury, as well as maintain written documentation concerning recommendations provided by a physician to the student-athlete and the player's history of prior concussion and associated recovery patterns.

217. Both the NATA and Vienna Position Statements also report the essential need for serial evaluation during the recovery process from cerebral concussion. The serial evaluation must be documented, yet is not mandated by the NCAA nor done by the schools.

**B. The NCAA's Failure to Follow the Consensus Best Practices Damaged Plaintiffs**

**1. The NCAA and EIU failed to follow the consensus best practices in the management of Arrington's concussions.**

218. Adrian Arrington ("Arrington") attended Eastern Illinois University ("EIU") and played football at EIU from 2005-2009.

219. At the outset of his NCAA career, on August 22, 2005, Arrington reported having suffered a mild "head injury or concussion,"<sup>138</sup> which appears to be from a "[st]inger from Football" in 2003. EIU passed Arrington for the exam with "[n]o reservations or contraindications for sports participation." However, Arrington was not given any baseline

testing prior to the season. Moreover, neither the NCAA nor EIU provided the required education regarding concussions.

220. On April 14, 2007, Arrington received a concussion during a scrimmage.<sup>139</sup> This was his second diagnosed concussion. The athletic trainer implemented a “treatment plan” that reflects “no activity until concussion symptoms subside.” The trainer did not refer Arrington to a physician, nor conducted any baseline or neuropsychological testing. Rather, the trainer merely requested that Arrington report any symptoms. Adrian reported headaches on April 15 and April 17. He returned to no contact practice on April 23, with a full return to practice on April 25, 2007. During this time, Arrington was only asked if he was symptomatic. He was not tested in accordance with the consensus best practices on concussion management.

221. Prior to the 2007-08 season, neither the NCAA nor EIU conducted any baseline testing nor educated its athletes regarding concussions.

222. On October 6, 2007, Adrian suffered his third diagnosed concussion in a game.<sup>140</sup> He returned to full activity approximately one week later on October 12, 2007. He did not undergo the required battery of neuropsychological testing to return to play. Following this concussion he should have been baseline tested prior to returning to play. He did not undergo the required and consensus recommended battery of testing required before he returned to play.

223. Prior to the 2008-09 season, neither the NCAA nor EIU conducted any baseline testing nor educated its athletes regarding concussions.

224. On November 15, 2008, Arrington suffered his fourth diagnosed concussion during a football game, and complained of dizziness and confusion with short term memory loss.<sup>141</sup> Arrington did not finish the game.<sup>142</sup>

225. Two days later, according to an EIU SportsMedicine Clinic Evaluation Form dated November 17, 2008, Adrian complained of headache and concussion.<sup>143</sup> Arrington-EIU431. The evaluation notes reflect that Adrian “had confusion all day on 11/15/08,” but did not have any symptoms on 11/16/08 or 11/17/08. It also incorrectly notes two (rather than three) prior concussions with similar symptoms.<sup>144</sup> The signing physician recommended that MRI and neurologist appointments be scheduled, that blood work be drawn, but she nonetheless concluded that Adrian was “ok for football as long as no return of symptoms.” The physician “[d]iscussed that I have no definitive reason to keep him off football but would consider the ramifications of play as he has already had two previous concussions and memory loss without a known blow, could definitely be a harbinger of some mild traumatic brain injury. However, I cannot definitively restrict him from play. He is comfortable with this discussion.” After an MRI, but without the required battery of tests that are standard for a neurological assessment, Arrington was cleared to play.<sup>145</sup>

226. After an intervening game and practices, or about December, 1, 2008, Adrian complained again of “confusion/memory loss.”<sup>146</sup> Adrian was evaluated by athletic training staff and recommended to schedule an appointment with Dr. Harry Bremer, a neurologist.<sup>147</sup> According to an EIU “Injury Report” note dated February 3, 2009, “Adrian reported another confusion episode on 1/31/09.”<sup>148</sup>

227. Finally, after four diagnosed concussions and multiple symptomatic episodes, on February 12, 2009, an athletic trainer at EIU accompanied Arrington to see Dr. Bremer, a neurologist.<sup>149</sup> Despite the fact that the athletic trainer should have kept copious records of Arrington’s concussion history and communicated this history to the physician, Dr. Bremer was only made aware of one concussion, noting: “At this time, he has had one possible concussion related to a closed head injury. He has had three other spells of amnesia for which there is no history for head injury. It is probably appropriate to continue with contact sports.” Dr. Bremer further noted that Arrington reported: “Recurring spells of amnesia, etiology indeterminate,” with potential “concerns for possible complex partial seizures.” Dr. Bremer requested an EEG, which returned normal. An EEG would not be appropriate for the diagnosis of concussion-related problems.<sup>150</sup>

228. Accompanied by his dad and an EUI athletic trainer, on June 15, 2009, Arrington saw a family medicine doctor complaining again of confusion:<sup>151/152</sup>

“Today, he comes after having multiple spells today. He was confused during an on field football practice, after practice while lifting and again while in the office today. These spells occur suddenly. He seems to be disoriented, has dilated pupils and some lip smacking activity and is unable to recount the events of the day, but is not lethargic and he does complain of a headache during this timeframe.”

Dr. Lystila started Adrian on Keppra<sup>153</sup> 500 mg twice a day, providing him with a prescription for Ativan<sup>154</sup> as well. *Id.* Again, Adrian is instructed not to drive and a follow-up appointment was scheduled with Dr. Bremer. *Id.*

229. On June 18, 2009, Arrington visited Dr. Bremer.<sup>155</sup> For the first time, Dr. Bremer raised concerns regarding Arrington’s concussion history:

“I am raising concerns as to any concussions he may have had. If he has had three concussions, he should abstain from all further contact sports. He understands that he should discuss this with his athletic trainer.”

*At this point in time, Arrington has had four diagnosed concussions and is symptomatic; yet both the NCAA and EIU allowed him to continue to play football in contravention of consensus best practices for concussion management. If I were treating Arrington I would not have allowed him*

*to return to play while taking seizure medicine, which was being used to stop symptoms of concussion or was related to head trauma.*

230. On July 13, 2009, accompanied by an EIU athletic trainer, Arrington sees a family medicine doctor after reporting “he does not feel right.”<sup>156</sup> The notes reflect:

“They report that he has been acting as though he is having a seizure all day. He did go to the Student Health Center earlier today, was given Dramamine and told to come back later. He has a large contusion to his forehead. He is uncertain how he got it.<sup>157</sup> Scratches to both ankles, again uncertain how they got there. He complains of nausea, vomiting and headache.”

The physician concluded:

“Seizure, likely due to poor medication compliance; however, with confusion and nausea with headache, unclear if possible head injury versus concussion. Will admit him to the hospital for observation, routine neuro checks, CT of his brain with and without contrast and continue his Keppra.”

231. According to the report of Adrian’s hospital observation stay, Arrington potentially suffered his fifth concussion, was not cleared to return to play, and was told to follow up with the trainer.<sup>158</sup>

232. On July 20, 2009, Arrington was evaluated at EIU’s SportsMedicine Clinic.<sup>159</sup> The notes reflect that the physician incorrectly believed that this was Arrington’s third concussion.

233. On July 23, 2009, Adrian saw Dr. Bremer, the neurologist, for a return visit.<sup>160</sup> Dr. Bremer finally recommended “no football at EIU this fall,” writing in his treatment notes “In all likelihood, most physicians would recommend avoiding contact sports.” Subsequently, Arrington wrote to the EIU Director of Athletics, requesting to be allowed to return to play because it was his senior year and because he had “earned the scholarship with hard work.”<sup>161</sup> On August 14, 2009, accompanied by a graduate assistant athletic trainer, Arrington again saw Dr. Bremer.<sup>162</sup> Despite Dr. Bremer’s earlier recommendation that Adrian avoid all contact sports and despite having received five documented concussions, Arrington was cleared to return to play. According to Dr. Bremer:<sup>163</sup>

“He has had at least two definite concussions. He understands that if he has anymore, that he should not be involved in contact sports at all

\*\*\*

We agree to the following [among other points]:

Providing that EIU sports approves of such, he may:

1. Start with at least three days of noncontact drill and conditioning in the weight room, etc.
2. He will continue on Keppra 750 mg, 1 b.i.d.
3. He will have a Levetiracetam level obtained at EIU health services with results faxed to me (note given to patient to have such).
4. He will not have any alcohol at all.
5. He will not miss any Keppra doses. If so, he should not drive, or engage in contact sports activities for at least one week.
6. He is scheduled to see Dr. Evans at SIU in Springfield for a second opinion on August 27, 2009.”

234. The very day, on August 15, 2009, Arrington attended football practice.<sup>164</sup> Prior to the Fall 2009 season, EIU did not conduct any baseline testing nor provided any education regarding concussions.

235. After multiple football games, on or about November 10, 2009 “Adrian had another episode today” and went to the emergency room.<sup>165</sup> He did not return to play.

236. On December 4, 2009, accompanied by a graduate assistant athletic trainer again, Arrington had a return appointment with Dr. Bremer.<sup>166</sup> Dr. Bremer recounts Arrington’s November 10, 2009 confusional episode. Dr. Bremer also notes that Arrington “has not played on the football team for the last three weeks.” Arrington “inquired about the need for any excuse from his studies because of his medical illness,” mentioning “he has had several doctors’ appointments beside the above noted symptoms.” However, despite the fact that rest is the cornerstone of treatment for concussions, Dr. Bremer did “not see a need to excuse him from his final examinations, as he has not had any ongoing long-term disability from his studies.”

237. While Arrington did not subsequently return to football, medical records indicate that he continues to suffer seizures, chronic severe headaches, depression, nausea and vomiting, photophobia, confusion, short-term memory loss/cognitive impairment, insomnia, and spells of unresponsiveness.<sup>167</sup> These conditions in my opinion stem from concussions.

238. On October 14, 2011, Arrington attended a “Multiplanar, multiecho MRI of the brain” exam at Sarah Bush. The report of the exam by Dr. Aldo Ruffalo notes that “[t]here is persistent cavum septum pellucidum and persistent cavum septum vergae,” as well as “volume loss identified in the right hippocampal region with linear signal abnormality present which is bright on T2-weighted pulse sequences. Findings are most likely on the basis of right mesial

temporal sclerosis.” Arrington-EIU255. Dr. Ruffolo did not find evidence of intracranial mass or hemorrhage, nor of acute hemorrhagic or ischemic infarction. *Id.* at 256. However, Dr. Bremer advised Arrington: “[t]he report indicates concerns for possible loss of brain tissues in the right temporal region, which is known to cause seizures. I have reviewed these films with a neuroradiologist at Carle who does not appreciate such. In Carle’s opinion, the MRI scan of your brain is normal.” Arrington-EIU244.

239. In my opinion, Arrington suffered from at least five concussions, including four during his NCAA career, and has post-concussion syndrome. The NCAA and EIU did not follow the consensus best practices for concussion treatment in Arrington’s treatment, causing him injury:

- The NCAA and EIU did not maintain a concussion management policy during Arrington’s tenure. The failure to maintain a concussion management policy resulted in Arrington receiving haphazard treatment based on poorly-maintained records of his concussions history.
- The NCAA and EIU did not perform baseline testing, including neuropsychological testing, of Arrington prior to his NCAA career or before each season in order to provide testing after each concussion to determine whether he had recovered. Thus, the NCAA and EIU did not assess Arrington based on the battery of tests that are standard for assessing the concussed athlete. Rather, they only assessed him based on his reporting of symptoms and cleared him to play against consensus best practices.
- The NCAA and EIU did not require that student athletes that suffered concussions be seen by physicians skilled in the diagnosis, treatment and management of concussions before returning to play.<sup>168</sup> Thus, Arrington was not treated appropriately by the trainer, the student health center, or the family physician.
- The NCAA and EIU did not require its trainers to maintain copious records nor to report accurate information to physicians. It is clear from the physicians’ records that the athletic trainers never accurately conveyed Arrington’s concussion history thus resulting in care against consensus best practices.

## **2. The NCAA and UCA failed to follow the consensus best practices in the management of Owen’s concussions.**

240. Derek Owens attended University of Central Arkansas and played football. At the time he started at UCA, UCA was aware that Owens had been knocked unconscious in a high school football game and was diagnosed with his first concussion.<sup>169</sup>

241. UCA did not provide baseline testing or educate students regarding concussions before Owens started to play.

242. Owens suffered his second concussion in June 2008 during a summer team practice before his freshman year when he was hit in the head from behind. UCA did not have any trainers or physicians on site. No one from the team provided him any treatment. After

practice, Owens called his parents, telling them he was dizzy, he was having difficulty seeing, and he did not think he could drive. He did not return to the summer practices. No one at UCA followed up with him.<sup>170</sup>

243. On September 4, 2008, Owens suffered his third concussion.<sup>171</sup> According to notes taken by a student athletic trainer:<sup>172</sup>

“Athlete complain[ed] of mild headache after being hit head on in football practice. He lost consciousness upon impact and was roused by the ATC who approached him first. When he was roused he described tingling sensation throughout his whole body. After confirming that the athlete had full sensation and movement in all extremities and that he had no neck or back pain he was allowed to get up and walk off the field. He stated he had mild headache and that he felt nauseated in the evaluation that followed. He denied any diplopia or tinnitus. Athlete was experiencing anterograde amnesia as he could not remember three words that the ATS had given him throughout the evaluation. His retrograde memory was normal however. Athlete stated he felt very tired and cold while in the ATR after the injury occurred. He had to be roused approximately four times from sleeping while sitting in the ATR. He was also experiencing photophobia. Athlete has previous history of concussions. He stated he has had three in the last three years. His last one occurred approximately one year ago while he was playing football. He experienced moderate headaches and nausea and vomiting [sic]. He saw doctor for the injury and after one week of no activity was released by the same doctor... Mental status was slightly abnormal in the sense that he was making statements and asking questions which were out of place.”

244. Diagnosed by the student athletic trainer with a concussion, the student athletic trainer noted:<sup>173</sup>

“Athlete and his roommate were sent home with list of signs and symptoms to look for throughout the night. He was instructed not to take pain killers for his headache as this could mask the symptoms of his concussion. Modalities are not warranted for concussion so none will be used. Athlete was instructed to go home and rest and not to lift weights or do any kind of strenuous activity until he was instructed he could do those activities again. Re-evaluate daily until signs and symptoms have ceased. Athlete

will perform stress test before he can re-enter activity. Athlete was informed that he could not re-enter practice or activity until he was cleared by an ATC. Athlete will be monitored until his symptoms subside. Immediate referral is not warranted although he was told to report to the ER if he experienced any of the symptoms listed on his informational sheet over night. If he continues to have symptoms or his symptoms get worse over the next couple of days, he will be referred.”

245. No one from UCA called Owens’ family, nor provided serial evaluation post-concussion. Moreover, despite telling Owens’ roommates he had a severe concussion, Owens was not referred to a physician for evaluation. Rather, the UCA trainers returned Owens to his dorm room, told his roommates that Owens had a “severe concussion,” and asked his roommates to wake him up every couple of hours to make sure he was okay.<sup>174</sup> Subsequently, Owens’ teachers complained that he was falling asleep in class and he reported he could not control falling asleep in class.<sup>175</sup>

246. On September 5, 2008, a UCA athletic trainer examined Owens. Owens still had a mild headache and nausea. The athletic trainer performed a Romberg and Singleton test, and memory test.<sup>176</sup>

247. On September 7, 2008, Owens was pulled from practice because he had not been cleared to play.<sup>177</sup> He still reported having a headache. The athletic trainer had Owens do a series of sit-ups push-ups and jumping after which he performed Romberg’s and Singleton’s test. The tests were normal. The trainer reported that Owens did not acquire headache from the test but approximately ten minutes after the test was complete he stated that he felt “cloudy.” Owens was not permitted to continue with functional testing or practice. According to the trainer’s notes: “He was informed of the dangers of continuing with activity after concussion, especially since he has already had three prior to this one. He was informed of second impact syndrome and the dangers associated with it. He was advised not to lie about his symptoms at any point in time and to inform us of any change in his health status.”<sup>178</sup> However, at no time did the athletic trainer refer Owens to a physician’s care or for neurological testing. This was contrary to the consensus best practices.

248. On September 9, 2008, despite continuing to be symptomatic with a dull headache behind his eyes and feeling “really tired,” the athletic trainer permitted Owens to lift weights.<sup>179</sup> Allowing a student athlete to lift weights while still symptomatic is against consensus best practices.

249. On September 10, 2008, Owens’ mother contacted the athletic trainer and told him about the June 2008 concussion.<sup>180</sup> The trainer discussed the June 2008 concussion with Owens, who confirmed that he had lost consciousness and “his whole body tingled.”<sup>181</sup> While

the trainer documented on September 10 that he had not known about the June 2008 concussion, the prior training notes reflect knowledge that Owens had suffered three concussions. The trainer finally referred Owens to the team physician.<sup>182</sup>

250. The team doctor cleared Owens to return to the practice team on September 16, 2008.<sup>183</sup> Before clearing him, Owens completed a stress test that included sit-ups, push-ups, jumping, jogging and sprinting. It lasted approximately 10-15 minutes during which he did not have symptoms.<sup>184</sup>

251. Subsequently, Owens' headaches returned. On July 28, 2009, while home from school, Owens visited his family doctor regarding headaches.<sup>185</sup> Owens reported that the headaches began in May 2009 following a football tackle. Owens reported "bitemporal throbbing headaches" occurring every 2 to 3 weeks, which "will make him sick to his stomach," often vomiting, as well as light sensitivity. Based on his examination, the physician noted "Headaches that sound migrainous," and he counseled Owens "about different ways to manage headaches," including "using Zomig nasal spray."

252. Owens reported this doctor's visit in writing to UCA on an August 10, 2009.<sup>186</sup> Owens reported that, since his UCA spring physical, he had received medical attention for "Migraines; saw doctor + got medicine; just taking when needed." An athletic trainer signed the form. The trainer did not refer Owens to the team physician, did not conduct any baseline or neurological testing, and did not counsel Owens regarding concussions. Rather, Owens played the Fall 2009 season without any inquiry by UCA into the cause of his headaches, for which he was taking prescribed medication.

253. After the season, on December 29, 2009, Owens again saw his family doctors, because he was having a "difficult time keeping up with his studies," "and he has generally not felt well for some time now." Owens reported a lack of energy, poor sleeping, "pretty frequent headaches" and stress.

254. Owens reported this visit to UCA on April 22, 2010 in a "Medical History Update" form.<sup>187</sup> Yet, UCA did not refer Owens to the team physician, did not conduct any baseline or neurological testing, and did not counsel Owens regarding concussions. Rather, Owens played the Fall 2009 season without any inquiry by UCA into the cause of his symptoms. Owens was cleared by EIU without limitations to participate in all sports.<sup>188</sup>

255. For the first time in August 2010, UCA conducted baseline testing of Owens using the Sport Concussion Assessment Tool 2.<sup>189</sup> Also for the first time in 2010, Owens apparently received the NCAA's one-page fact sheet called "Concussion: A Fact Sheet for Student-Athletes."<sup>190</sup>

256. On September 25, 2010, Owens apparently received a fifth concussion during a punt return. His mom could see that he hit his head from her view in the stands.<sup>191</sup> The fact that Owens was hit hard was documented in a local newspaper story that reported on the hit.<sup>192</sup>

257. No one from the team checked on Owens when he returned to the sidelines. Owens described that when he returned to the sidelines, his head was throbbing, he felt pressure in his head, his head felt like it had swelled in size, and he heard ringing in his ears. He had difficulty standing and getting his helmet off. On the way home from the game on the team bus, Owens texted his mother and told her he had a migraine. Owens spoke to two assistant trainers on the bus and told them of his symptoms, and they provided Owens with medication, which he assumed to be ibuprofen or Tylenol. The trainers did not document the symptoms or treatment, nor refer him to the head trainer, team physician or for follow-up care. This conduct was against consensus best practices.

258. During Spring 2011, Owens sought help from his head coach for his ongoing symptoms, including his migraines, for which he admitted that he had tried to self-medicate with marijuana.<sup>193</sup> His coach did not refer him to the team physician, have him examined or provide any counseling or support. A proper Concussion Management Plan would have had the coach refer Owens to a doctor.

259. On June 20, 2011, Owens visited his family doctor regarding his concussion history, memory loss, severe or frequent headaches, and difficulty concentrating. The doctor referred Owens to a neurologist.<sup>194</sup>

260. On or about July 20, 2011, Owens met with Dr. Tim Freyaldenhoven, a neurologist, for a neurologic evaluation regarding Owens' headaches.<sup>195</sup> Dr. Freyaldenhoven's notes reflect that Owens experienced headaches after his concussion and connects them to football: "he does have a headache for 5 seconds, or five minutes, or the rest of the game after he gets hit." Owens further reported decreased academic performance, test anxiety and having "to stay up the night prior and cram for tests." And, Dr. Freyaldenhoven's notes reflect that Owens "is concerned because he doesn't have memories of certain significant events in the past. He had a trip to Branson just before college that he has no recollection of."

261. Dr. Freyaldenhoven concluded that "he has likely had several concussions in addition to those diagnosed. His apparent decline academically is also worrisome. His mother has a history of headaches which sound migrainous and he has other family members with that diagnosis." Dr. Freyaldenhoven noted his experience that "migraineurs are somewhat prone to concussions." And, he concluded that Owens "may also have underlying ADD and depression which can certainly contribute to his academic decline." Dr. Freyaldenhoven also identified a connection between concussions and depression: "closed head injury is associated with an increased risk for depression."

262. Dr. Freyaldenhoven's notes stated that Owens should "refrain from activities with a high risk of contact injuries," as "[h]e certainly has proven himself to be prone to concussions." Dr. Freyaldenhoven further concluded "that there is a reasonable probability that his academic decline is related, directly or indirectly, to his history of concussions." Dr. Freyaldenhoven prescribed Owens a trial of Cymbalta to help with mood and concentration and also referred him for formal neuropsychological testing to document Owens' current functioning levels.

263. On August 2, 2011, Owens' mother informed UCA's head athletic trainer of Owens' concussions, his symptoms and his current neurology appointments.<sup>196</sup> UCA did not offer to provide medical support or accommodations for the upcoming school year

264. On August 23, 2011, Derek attended a neurocognitive evaluation with Dan Johnson, PhD, a clinical neuropsychologist, following a referral by Derek's primary care physician.<sup>197</sup> Regarding his cognitive symptoms, Owens reported "short term memory problems, decreased learning capacity, impoverished sustained attention/concentration, slowed processing speed, mental 'fog' or 'haze,' and decline in test taking/academic achievement." In addition, he reported emotional symptoms such as "significant anxiety, frustration, discouragement, increased irritability, and mood swings." And, he reported physical symptoms as well, i.e., "near constant, daily headaches of varying severity which cause pain, distract and exacerbate both [h]is cognitive and emotional symptoms."

265. During the battery of neurocognitive tests administered by Dr. Johnson, Dr. Johnson found that Owens "perform[ed] well within expectations across many functional cognitive domains," including regarding overall level of cognition, basic academic performances, formal language tasks, visual/special-construction tasks, abstract reasoning/problem solving. "There were; however, areas of concern - highlighted by less than optimal verbal learning curve, significant ease of distraction via proactive interference (introduction of new information interferes with consolidation/storage of previously just learned information), wildly fluctuating inconsistent attention/concentration, variable/inconsistent processing speed, and less than optimal short term visual memory recall." "Based on the constellation of current objective neurocognitive findings," Dr. Johnson concluded that "Derek is likely experiencing significant post concussive syndrome symptoms, which are adversely impacting his cognition in several key areas, as well as emotional/behavioral status."

266. Dr. Johnson concluded: "There appears to be a significant relationship between the patient's concussions and the onset of cognitive and emotional/behavioral symptoms Derek currently is experiencing." And he agreed that Owens should not play football his senior year.

267. Subsequently, Owens provided his coach with a copy of a July 20, 2011 letter from Dr. Freyaldenhoven which stated: "I have suggested that [Owens] refrain from activities with a high risk of contact injuries." He also provided his coach with a copy of the report from Dr. Johnson, which provided: "...Derek is likely experiencing significant post concussive

syndrome symptoms, which are adversely affecting his cognition in several key areas, as well as emotional/behavioral status. \*\*\* The decision to forego his senior year of football appears to be a wise one. There appears to be a significant relationship between the patient's concussions and the onset of cognitive and emotional/behavioral symptoms Derek currently is experiencing.”<sup>198</sup>

268. UCA did not offer to provide ongoing medical care or follow-up or offer academic accommodations, but advised Owens that it would withdraw his scholarships.

269. In a letter dated December 6, 2011, Dr. Johnson drafted a letter to UCA, stating that Owens “underwent an extensive neurodiagnostic assessment...to evaluate/assess his cognitive/neurological issues.”<sup>199</sup> In the letter, Dr. Johnson conveyed what “appears to be a significant relationship between the patient’s concussions and the onset of cognitive and emotional/behavioral symptoms Derek is currently experiencing.” He also added that “[t]he patient’s plummeting GPA over the past several semesters is a common consequence of post concussive symptoms experienced.” Because Owens’ performance “was likely adversely impacted in a significant manner” by concussions, Dr. Johnson suggested that it would be “appropriate and prudent” for Owens “to re-take select coursework from past semesters without penalty.”

270. Since that time, Owens has struggled academically and has been unable to finish a semester of classes. Owens continues to report migraines, moodiness, anxiety, feeling “short-fused,” depression, trouble concentrating and short-term memory problems.<sup>200</sup>

271. In my opinion, Owens suffered from at least five concussions, including four during his NCAA career, and has post-concussion syndrome. The NCAA and UCA did not meet their duty of care and the consensus best practices in the following ways in Owens’ treatment, causing him injury:

- The NCAA and UCA did not maintain a concussion management policy until after Owens had suffered four concussions, including three at UCA. The failure to maintain a concussion management policy resulted in Owens receiving haphazard treatment without properly-maintained records of his concussions history.
- The NCAA and UCA did not perform baseline testing, including neuropsychological testing, of Owens prior to his NCAA career or before each season (until he had already suffered four concussions) in order to provide testing after each concussion to determine whether he had recovered. Thus, the NCAA and UCA did not assess Owens based on the battery of tests that are standard for assessing the concussed athlete with a baseline for comparison. Moreover, Owens was allowed to play while symptomatic.
- The NCAA and UCA did not require that student athletes that suffered concussions be seen by physicians skilled in the diagnosis, treatment and management of concussions before returning to play. Thus, Owens was not treated in accordance with the consensus best practices, including but not limited

to when he reported symptoms to student trainers who did not require Owens to be seen by a physician.

- The NCAA and UCA did not require its trainers to maintain copious records nor to report accurate information to physicians. It is clear that the athletic trainers never accurately conveyed Owens' concussion history thus resulting in care against consensus best practices.

**3. The NCAA and OBU failed to follow the consensus best practices in the management of Palacios' concussions.**

272. Prior to attending Ouachita Baptist University (OBU) and playing soccer, Angelica Palacios advised OBU in writing that she had received three concussions while playing soccer for club teams.<sup>201</sup> After the second concussion, Palacios began wearing protective headgear. She told her OBU coaches she wore protective head gear to prevent further concussions.<sup>202</sup>

273. OBU did test Palacios with ImPACT testing, but did not provide any further baseline testing, nor provided education regarding concussions or the potential for long-term consequences from the concussions.<sup>203</sup>

274. Before her sophomore year, OBU did implement a concussion management plan; however, it fell far short of the standards in the industry.<sup>204</sup> Moreover, OBU did not, in fact, follow the concussion management plan in its management of Palacios.

275. On September 13, 2011, Palacios was "headed" by another soccer player during OBU practice.<sup>205</sup> According to the trainers' notes:

"Athlete walked off the field during soccer practice holding her left eye. She stated that "she got headed in the eye by soccer player in front of her." Upon inspection, a contusion was noted above her left eye. When asked, the athlete said "she felt little dizzy and had headache, but also stated that she had the headache before practice began from cold". She also said that she took Nyquil before practice for her cold. Ice was immediately applied to the contusion for 15 minutes and again 45 minutes later. She was advised to continue to ice it periodically for 15 minutes through the evening. The probability of concussion was discussed and instructions were emailed to the athlete to take the IMPACT test in her room the next day."

276. The OBU training staff gave her ice to apply to her face and sent her to her dorm room.<sup>206</sup> Palacios' eye swelled shut and she developed a black eye. Contrary to the consensus best practices, no one from the OBU training staff checked on Palacios in the hours after she sustained the concussion, nor did they refer her to a physician for care.

277. According to trainer notes dated September 14, 2011:<sup>207</sup>

“Athlete came to the Athletic Training room as instructed. Upon inspection, edema and ecchymosis was noted in and around left eye. The athlete could not open her left eye without assistance; however, pupils were equal and reactive. Slight hemorrhage in lower lateral corner of her sclera was also noted. No vision deficit and athlete was walking normal (no balance issues). Upon palpation of the athlete’s forehead, no crepitus was found, though pain was present. No other signs or symptoms were noted at this time.”

OBU did not refer Palacios to the team physician for treatment against consensus best practices.

278. Palacios did take the ImPACT test on September 14, 2011.<sup>208</sup> When compared to her baseline, Palacios reported a number of symptoms related to concussion, as well as a different Cognitive Efficiency Index score:

	August 17, 2010 ImPACT Clinical Report (Palacios-OBU-48)	September 14, 2011 ImPACT Clinical Report (Palacios-OBU-43)
Cognitive Efficiency Index <sup>209</sup>	0.52	0.39
Total Symptom Score (Includes such symptoms as headache, nausea, light sensitivity, concentration difficulties, and more)	2 Total Symptoms	26 Total Symptoms

279. The above results are one indicator that Palacios was experiencing symptoms from her concussion. Based on these results, OBU should have immediately referred Palacios to a physician skilled in the diagnosis, management and treatment of concussions. OBU’s failure to do so was a violation of the consensus best practices.

280. According to trainer notes for September 15, 2011: “Athlete was withheld from practice and continued to ice her eye. Edema and ecchymosis were still present and she could not open her eye.”<sup>210</sup>

281. According to trainer notes for September 16, 2011, Palacios was referred to a physician “to check for bleeding behind her cornea. No bleeding was found and athlete was subsequently released to practice.”<sup>211</sup> No concussion-related testing was performed.<sup>212</sup>

282. Palacios continued to experience headaches in the following days. On Saturday, September 17, 2011, Palacios vomited, was nauseated and had a severe headache. Thus, Palacios attended soccer practice dressed in non-athletic clothing. When Palacios did not run with the team, her coach informed her that she should be running with the team. When Palacios stated that she had a concussion and was not supposed to run, the coach became angry. The coach informed Palacios that a recruit was watching practice and asked Palacios if she was trying to embarrass him in front of the recruit.<sup>213</sup>

283. Palacios then stated that the trainers told her that if something was wrong she should not participate. The coach told Palacios not to listen to the trainers and that, "you know if you can run." The fact that the coach was allowed to overrule the trainers is in direct contravention to the consensus best practices and the NCAA's duty of care and further a reflection that OBU had not educated the coaches about the concussion management plan and/or did not follow the concussion management plan.

284. The coach then asked a nearby trainer who stated – after confirming with the head trainer – that Palacios could run, but that she should stop running if her head started hurting worse. The fact that the trainer cleared Palacios to play despite being symptomatic was clearly not in accord with the NCAA's duty of care or consensus best practices.

285. Palacios was sent to her dorm room to change into athletic clothing. On her way to her dorm, she called her mother and informed her what was happening. When Palacios returned to practice, she ran one lap but started to feel sick. Her coach told her that she should go sit out and that she should plan on sitting out for a long time because her mother called him and told him she should not participate due to her head injury.<sup>214/215</sup> OBU did not refer Palacios to a physician or conduct any further testing.

286. On September 19, 2011, Palacios reported significant pain. First, she went to see a chiropractor.<sup>216</sup> Then, her parents took her to the emergency room,<sup>217</sup> for an evaluation of her left orbital and facial area following the injury while playing soccer. She reported dizziness and nausea with headache, reporting to the hospital for increased left eye/periorbital pain, which continued even after rest and after use of over the counter medications. She received a diagnosis and discharge instructions related to, among other things, (1) closed head injury, (2) contusion, and (3) subconjunctival hemorrhage (a collection of blood under the lining of the eye).<sup>218</sup> The doctor informed Palacios that she needed at least two more weeks of rest before she could do any physical activity.<sup>219</sup>

287. Following her September 17, 2011 premature return to play at her coach's instance, Palacios did not return to the OBU soccer team and retired from soccer. OBU did not provide Palacios with any further care or academic accommodations.

288. In my opinion, Palacios suffered from at least four concussions, including one during her NCAA career, and suffered from post-concussion syndrome. The NCAA and OBU did not follow the consensus best practices in the following ways in Palacios' treatment, causing her injury:

- The NCAA and OBU did not mandate that the 2011 concussion management policy roughly drafted by OBU be followed. Had an appropriate concussion management plan been implemented and followed, the coach would not have had the ability to override the trainers' decision to withhold Palacios from play, and Palacios would not have been returned to play while still symptomatic.
- The NCAA and OBU did not require that student athletes that suffered concussions be seen by physicians skilled in the diagnosis, treatment and management of concussions before returning to play. Thus, Palacios was not treated in accordance with consensus best practices and NCAA's duty of care, including but not limited to when she reported symptoms to trainers who did not require Palacios to be seen by a physician skilled in the diagnosis, treatment and management of concussions.
- The NCAA and OBU did not require its trainers to maintain copious records nor to report accurate information to physicians. It is clear that the athletic trainers never accurately conveyed Palacios' concussion history to a physician thus resulting in care against consensus best practices.
- The NCAA and OBU did not prohibit coaches from overruling trainer decisions on returning to play, nor prevented a direct line reporting from trainers to coaches, thus resulting in the care of Palacios against concussion best practices and care that was egregious in that the coach directed her to return to play while symptomatic.

#### **4. The NCAA and Maine failed to follow the consensus best practices in the management of Solomon's concussions.**

289. Prior to attending the University of Maine ("Maine"), Kyle Solomon suffered three concussions while playing junior hockey in 2000, 2005, and 2007.<sup>220</sup> Moreover, in March 2008, he was seen by a psychiatric mental health nurse practitioner, for "Having problems with focusing."<sup>221</sup> The nurse noted: "Head Injuries: a couple of concussions: 3-4 years ago, one on the ice where he felt 'pretty loopy' he could not stand up, but he feels he did not have any sequel from this." The nurse determined that "Kyle meets criteria for ADHD inattentive type," and prescribed Adderall. Maine was aware of at least Solomon's 2005 and 2007 concussions.<sup>222</sup> Maine also was aware that Solomon had a history of concussions no later than October 8, 2008 as reflected in a medical note by Maine team physician Dr. John D. West, III in which he noted Solomon "has had a history of concussions in the past and comes in now as a freshman hockey player."<sup>223</sup>

290. During his freshman hockey season in 2008, Solomon was administered the ImPACT baseline test.<sup>224/225</sup> However, Solomon was not provided any catastrophic injury

education, including but not limited to regarding concussions or the long-term consequences of brain injuries.

291. Solomon sustained his fifth concussion, and first concussion during his NCAA career, during a November 9, 2008 Maine hockey game.<sup>226</sup> Midway through the second period, Solomon was blindsided by an opposing player and hit his head above the right ear on the ledge of the boards and immediately lost consciousness. When he awoke, he was seeing “stars” and experienced double vision for approximately 10 minutes. The team trainer removed him from the ice. The trainer and team physician examined Solomon in the locker room. Solomon was asked to follow the path of the trainer’s finger and also the path of a flashlight. Solomon was not administered a baseline test or any other tests. The trainer observed that Solomon’s eyes were dilated. Solomon received seven stiches from Dr. West and returned to the game in the third period. Returning a player that lost consciousness to play during the same game is contrary to the consensus best practices. Returning Solomon to the game put him at direct risk for permanent brain injury from the slightest hit. Neither the trainer or physician provided the serial follow-up to a concussion required in all standards. Moreover, neither the trainer nor the physician documented the incident. In fact, despite the fact that Maine had administered the ImPACT baseline test at the outset of his career, no further testing was done post-injury to determine whether or when Solomon was asymptomatic from the injury.

292. After the game, Solomon was told by the trainer to go back to his dorm room and rest. At this time, Solomon lived alone and there was no one to monitor his condition. Solomon was incoherent when he spoke with his father that evening. Leaving an athlete with a head injury alone in the immediate hours after a head injury is contrary to the consensus best practices and put Solomon directly at risk for harm.

293. Solomon was symptomatic for several days thereafter, suffering from headaches and sensitivity to light. Solomon was evaluated by Dr. West on November 19, 2008 for his sutures received from the hit. According to Dr. West’s exam notes: “We also looked at the sutures just behind his right ear from the laceration he had at game time ten days ago and the laceration has healed up well. It is at the junction of the hairline. We agreed today we would leave the sutures in through the weekend series with Merrimac where the helmet pads rub in this area, rather than take them out where we can’t Steri-strip them. We will remove them the following day after the weekend series.”<sup>227</sup> Again, the physician failed to conduct any neuropsychological or neurocognitive testing, to compare against Solomon’s baseline, to determine whether he could be cleared to play.

294. On September 9, 2009, the team physician passed away unexpectedly. Maine did not replace him for the duration of Solomon’s tenure on the hockey team. Failure to have a team physician is against consensus best practices, because a collision sport at high risk of concussion, as well as catastrophic injury, should have a team physician to assess such injuries.

295. On December 26, 2009, Solomon visited the emergency room and his father provided the records to Maine on January 4, 2010.<sup>228</sup> Solomon's symptoms included low energy, cold sweats, decreased appetite (since before Christmas), headaches, pressure behind his eyes, and abdominal pain.

296. On February 26, 2010, Solomon was struck in the throat and helmet cage during a hockey game and was transported by ambulance to the hospital.<sup>229</sup> Solomon complained of throat pain and headache. Notes from an otolaryngology consultation by Dr. William Postal indicate a diagnosis of "Blunt trauma to the laryngeal skeleton suffering hemorrhage of the right vocal cord."<sup>230</sup> Solomon was instructed to "do no strenuous activity for at least one week, perhaps two weeks." Based on his symptoms, it appears that Solomon suffered his sixth concussion, and second NCAA concussion, during this game. Solomon was cleared to play by a physician with respect to his throat injury on March 3, 2010.<sup>231</sup> However, Maine did not conduct the ImPACT or other baseline testing, or otherwise test Solomon for concussion.

297. On March 10, 2010, Solomon suffered his seventh concussion, and third NCAA concussion, during practice from a "soft" elbow to the side of his head. No team physician existed, was present or consulted. The following day, Maine administered the ImPACT test for Solomon.<sup>232</sup> Solomon was administered a post-injury ImPACT test and diagnosed with a Grade 3 concussion by the trainer. According to Maine's ImPACT Clinical Report, Solomon's scores and symptoms were as follows.

<b>Composite Scores</b>	<b>11/6/2008 Baseline Test</b>	<b>3/11/2010 Post-injury Test</b>	<b>3/12/2010 Symptom Inventory</b>	<b>3/13/2010 Symptom Inventory</b>	<b>3/14/2010 Symptom Inventory</b>	<b>3/15/2010 Symptom Inventory</b>	<b>3/17/2010 Symptom Inventory</b>
<b>Memory composite (verbal)</b>	86 (35%)	90 (55%)					
<b>Memory composite (visual)</b>	34 (<1%)	55 (4%)					
<b>Visual motor speed composite</b>	35.48 (39%)	31.60 (19%)					
<b>Reaction time composite</b>	0.51 (77%)	0.75 (1%)					

<b>Impulse control composite</b>	11	4					
<b>Total Symptom Score</b>	0	9	14	7	7	2	2

298. The impact of these scores is that the visual memory composite and reaction times are grossly impaired following the concussion and the visual memory composite scores were grossly impaired prior to the concussions raising second questions about the validity of the testing. These questions should have been evaluated prior to clearing him to play.

299. Solomon experienced headaches, dizziness, drowsiness, light sensitivity, nausea, and difficulty falling asleep for at least seven days following the injury. The trainer failed to refer Solomon to a physician for follow up care.

300. Approximately two weeks after sustaining the concussion, Plaintiff was cleared for return to play while symptomatic. Solomon was throwing up at the time and still had not been seen by or referred to a physician. Solomon telephoned his father and said that he did not feel right and that he felt like a different person, including changes to his personality, depression, and feeling disconnected from reality.<sup>233</sup> It is against consensus best practices to return an athlete to play while symptomatic and contrary to the NCAA's duty of care.

301. Solomon's father scheduled an appointment with me, Dr. Robert C. Cantu, for April 9, 2010. I examined Solomon and concluded that Solomon's brain sustained severe trauma and diagnosed postconcussion syndrome. I advised Solomon of the risks of second impact syndrome, restricted him to walking and restricted him from lifting anything over five pounds.<sup>234</sup> Based on my recommendation, Solomon retired from hockey.

302. Since that time, Solomon continues to suffer from headaches (including migraines caused by sensitivity to light, working on a computer, or stress), short term memory loss, intense psychological distress, anxiety, seizures, struggles with schoolwork and has been placed on restrictions regarding homework and examinations, avoiding physical activities beyond walking, and avoiding unnecessary mental activity.<sup>235</sup>

303. In my opinion, Solomon suffered from at least seven concussions, including three during his NCAA career, and suffered from post-concussion syndrome. The NCAA and Maine did not follow the consensus best practices in the following ways in Solomon's treatment, causing him injury:

- The NCAA and Maine did not maintain a concussion management policy during Solomon's career. The failure to maintain a concussion management policy

resulted in Solomon receiving haphazard and inconsistent treatment, allowed the coach to make return to play decisions even while Solomon was symptomatic, and resulted in Solomon being diagnosed by a trainer without physician oversight or follow-up. Moreover, without a clear policy, Solomon was permitted to play at Maine despite having received four prior concussions.

- The NCAA and Maine did not perform baseline testing overseen by a physician, such that the ImPACT test used was used inconsistently without proper interpretation and follow up.
- The NCAA and Maine did not require that student athletes that suffered concussions be seen by physicians skilled in the diagnosis, treatment and management of concussions before returning to play. Thus, Solomon was not treated in accordance with the consensus best practices and NCAA's duty of care, including but not limited to when he reported symptoms to trainers who did not require Solomon to be seen by a physician skilled in the diagnosis, treatment and management of concussions.
- The NCAA and Maine did not require its trainers to maintain copious records nor to report accurate information to physicians. It is clear that the athletic trainers never accurately conveyed Solomon's concussion history to a physician thus resulting in care against the consensus best practices.
- The NCAA and Maine did not prohibit coaches from making return to play decisions, nor prevented a direct line reporting from trainers to coaches, thus resulting in the care of Solomon against consensus best practices in directing him to return to play while symptomatic.

## **XI. MEDICAL MONITORING FOR CURRENT AND FORMER NCAA STUDENT ATHLETES THAT PLAYED CONTACT SPORTS**

### **A. The Purpose of a Medical Monitoring Program for Student-Athletes That Played Contact Sports While Playing At An NCAA School**

304. Concussions and sub-concussive hits that are unrecognized put student athletes at considerable risk of potentially catastrophic sequelae from re-injury. Repetitive head trauma (whether concussion or subconcussive hits) from participation in contact sports such as soccer, ice hockey, basketball, field hockey, lacrosse and wrestling can lead to a permanent decrease in brain function, including: memory loss, early Alzheimer's-like disease called chronic traumatic encephalopathy (CTE), movement disorders such as parkinsonism, and emotional disturbances. Also, as discussed above, one of the most notable complications of concussion is second impact syndrome. In this syndrome, an athlete who is recovering from an initial concussion sustains a subsequent concussive injury, resulting in diffuse brain swelling and severe, permanent neurological dysfunction or death. Thus, timely diagnosis and prompt treatment can help prevent more serious concussion complications.

305. Here, the purpose of a medical monitoring program of current and former student-athletes that have played contact sports is to determine whether they are suffering from post-concussion syndrome or other cognitive impairments or mental disturbances. Student-athletes

may not have any idea that the debilitating symptoms that they are experiencing were caused by their head injuries – and thus are not seeking the available treatments that they need to ease their symptoms associated with their head injuries.

306. For example, armed with a diagnosis of post-concussion syndrome, student-athletes will be able to seek the intervention and treatment they need. Treatment of post-concussion syndrome focuses on helping the person return to an active, functional lifestyle. Treatment incorporates physical and cognitive therapy programs to help alleviate difficulties associated with mild traumatic brain injury. It may include physical therapy for difficulties with motion and vestibular sensitivity; occupational therapy to address daily activities and functional vision deficits; speech and language therapy to improve language skills and cognitive deficits; and psychological counseling to cope with concerns at home, work or school. I also prescribe medication in cases that fail to respond to physical and cognitive rest alone, plus the above interventions. This is especially true when one symptom dominates all other symptoms.

307. Post-concussion syndrome treatments are aimed at easing specific symptoms in order to allow the injured person to lead a more normal life. Moreover, the symptoms of post-concussion syndrome often improve after the affected person learns that there is a cause for his or her symptoms, and that they may improve with time. Education about the disorder can ease a person's fears and help provide peace of mind.

308. For example, one symptom of post-concussion syndrome is headaches. Many student-athletes with headaches may try to self-medicate, but overuse of over-the-counter and prescription pain relievers may actually contribute to persistent post-concussion headaches. Thus, a diagnosis of post-concussion syndrome will allow a student-athlete to seek proper treatment for their headaches. Medications commonly used for migraines or tension headaches, including some antidepressants, appear to be effective when these types of headaches are associated with post-concussion syndrome. These medications may include Amitriptyline, which is a medication that has been widely used for post-traumatic injuries, as well as for symptoms commonly associated with post-concussion syndrome, such as irritability, dizziness and depression. Nortriptyline, Propranolol, or Verapamil can also help greatly.

309. Another symptom of post-concussion syndrome is a problem with memory and thinking (such as an inability to organize or multi-task). Student-athletes with these problems may believe that they are suffering from ADD or ADHD, but in fact with an appropriate diagnosis could obtain cognitive therapy. Cognitive rehabilitation can address thinking problems through a number of treatment approaches.

310. Cognitive rehabilitation may include education in order to improve an individual's understanding of thinking processes. With increased awareness, people may start to feel a sense of control and support and will realize their symptoms are not uncommon.

311. Cognitive rehabilitation may include compensating. Therapists can provide individuals with practical ideas they can implement to compensate for cognitive difficulties. These suggestions are tailored to meet each person's specific needs for improving functioning at home, work and/or school. The use of memory aids and time management techniques are examples of compensatory strategies.

312. Cognitive rehabilitation may include process-specific training, which consists of intensive exercises designed to provide repetitive practice in identified problem areas such as attention. Through this practice, individuals develop a greater understanding of where breakdowns occur and how to manage them outside of the treatment setting.

313. The overall goal of cognitive therapy is to increase the individual's ability to meet the demands of daily life.

314. For difficult cognitive or thought symptoms (feeling in a fog) or problems with concentration or memory, the neurostimulants in the methylphenidate group – Ritalin, Adderall, Concerta, Straterra, and Amantadine – can also be very beneficial.

315. Other symptoms of post-concussion syndrome include depression and anxiety. Some treatment options include psychotherapy and/or medication, such as Lexapro or Zoloft.

316. Trouble falling asleep can be helped by the prescription medications Trazodone or Ambien.

317. Other non-medicinal therapies that are employed with success in post-concussion syndrome include vestibular therapy (head and eye exercises) if dizziness or balance are primary symptoms, and upper cervical spine physical therapy for pain in the upper neck and back of the head.

318. Ultimately, the goal of a medical monitoring program, in determining whether a student-athlete has post-concussion syndrome or other impairments associated with head trauma, is to provide the student-athlete with the information that they need to seek treatment outside the confines of this medical monitoring program.

## **B. Recommended Medical Monitoring Program**

### **1. Overview of scope and costs**

319. In my opinion, based on my experience and consensus best practices, the medical monitoring program should include focused neurocognitive, visual, and balance assessments as part of the overall neurological examination. Concussions and subconcussive hits may cause trauma to the calcarine cortex, which is in the back of the brain and controls vision, and the cerebellum, at the top of the neck, where balance and coordination are measured. These areas are assessed in the neurological assessment. Concussions and subconcussive hits may also cause

trauma to the thinking and reasoning parts of the brain (medial temporal lobe and frontal lobe). These areas are assessed in the neurocognitive assessment.

320. The neurological assessment would include a prior concussion history and conditions that affect concussion recovery, symptom checklist, plus a neurological examination (focused on cognitive, visual tracking (King Devick test), and balance (Modified Balance Error Scoring System). Based on my experience, as well as published costs, the estimated physician cost for the neurological assessment is \$500 per person and the cost of the King Devick test is \$1.75 per person (based on 1,000 persons). The neurological assessment would be conducted by a physician with experience in the diagnosis, treatment and management of concussion.

321. The neurocognitive assessment would use combined computer-based and paper-and-pencil testing to assess cognitive skills, mood, and behavior. This assessment would be administered by a trained technician. If the results fell below normative data, the results would be reviewed by a neuropsychologist. Based on my experience, as well as published costs, the estimated cost for the technician and/or neuropsychologist would range from \$300-500 per person. Moreover, the cost of the computer-based testing (described below) is approximately \$20 per person.

322. Accordingly, based on my experience, the costs of the medical monitoring program on a per-person, per-examination basis are estimated to be \$821.75 (when the results of the neurocognitive assessment are not below normative data) to \$1,021.75 (when the results of the neurocognitive assessment are below normative data and a neuropsychologist must review the results). In my opinion, student-athletes that have played contact sports should be examined at the outset of the program, and then should return for the same examination once every five years or when symptomatic.

323. If this medical monitoring program were approved, a Request for Proposals would be issued to regional hospitals or centers across the United States to provide the described tests by the medical personnel described within the range of costs described. It is well known that such centers would include, but not be limited to: tertiary institutions, *i.e.*, a teaching hospital or trauma center.

324. Moreover, prior to the initial appointment of each student-athlete, the NCAA would facilitate the transfer of the files maintained by the respective school's athletic department (such as files maintained by the athletic trainer) reflecting the individual student-athlete's medical history, testing and care to the physician conducting the medical monitoring program.

325. The tests and examinations to be conducted at each student-athlete's appointment(s) are described in detail below.

## 2. Neurological assessment

326. The first component of the medical monitoring program is the neurological assessment. The neurological assessment measures critical brain functions that can be adversely affected by head trauma, such as thought, balance and vision.

327. The neurological assessment first includes a concussion history, a medical history with respect to conditions that may affect concussion recovery, and an assessment of current symptoms. In accordance with the consensus best practices, the student-athlete would complete an intake sheet. Attached as Appendix D is an example of a concussion intake sheet that I use in my practice and I recommend for use here.

328. On the first page, the student-athlete would list every single concussion they have ever had, the date of each concussion, and every single symptom they experienced for each concussion. For every symptom, the student-athlete scores the symptom on a scale of 0 (not present) to 6 (severe). Based on that page, the physician scores the symptom load and score, and determines not just how many previous concussions the patient had, but also how severe they were. This is important as a tool because all concussions are not equal and those with higher symptom scores and those that last a long time are of more concern.

329. On the second page, the student-athlete would disclose conditions which affect concussion recovery and which will affect when the patient is truly asymptomatic. For example, if a patient had a history of migraines, the migraines may get worse from a concussion. However, the patient would be considered asymptomatic once the migraines were reduced back to the pain level, or baseline level, that pre-existed the concussions. This is important as a tool to allow the physician to determine when the patient is asymptomatic as it relates to the concussions.

330. On the third page, the student-athlete would disclose the symptoms they are experiencing on the day of presentment. While this third page lists the same symptoms as on the first page, the information sought is limited to that day's symptoms. This is important as a baseline to compare with in the future to determine whether symptoms have improved or completely resolved.

331. Next, the physician would conduct a complete neurologic examination, which includes three key parts that tend to have a greater chance to show abnormalities.

332. First is the cognitive part, in which the physician tests memory, attention, learning, and that is tested in greater detail by the neurocognitive assessment tool described below.

333. The second part tests eye tracking and vision and can be done using the King-Devick Test.<sup>236</sup> Published studies show that deficiencies in saccadic eye movements can be an indicator of mild TBI. Studies published in Neurology and the Journal of The Neurological

Sciences have determined that post head-trauma related deficiency in the King-Devick Test is an indicator of mild TBI or concussions. The King-Devick Test is based on the time to perform rapid number naming. It involves reading aloud a series of single digit numbers from left to right on three test cards as quickly as possible without making any errors. The King-Devick test takes two minutes to complete. The cost of the King-Devick Test is \$1.75 per athlete for 1,000 athletes.

334. The third part tests balance and can be done using the Modified Balance Error Scoring System (BESS). Balance assessment or posturography integrates three systems in the body: somatosensory (an individual's ability to determine touch, temperature and their body's position in space); visual (an individual's ability to see movement); and vestibular (an individual's ability to balance or maintain equilibrium). Concussed athletes have difficulty integrating information from the three components of the balance mechanism. The Zurich Consensus Statement provides that "postural stability testing provides a useful tool for objectively assessing the motor domain of neurologic functioning, and should be considered a reliable and valid addition to the assessment of athletes suffering from concussion, particularly where symptoms or signs indicate a balance component." The Modified BESS consists of two stances (standing on one leg and standing with one foot in front of the other) on a firm and foam surface. A study published in the Clinical Journal of Sports Medicine demonstrates that the Modified BESS provides reliable objective information for clinicians.<sup>237</sup> This test takes approximately five minutes.

### **3. Neurocognitive assessment (a/k/a neuropsychological testing)**

335. The second component of the medical monitoring program is the neurocognitive assessment. The neurocognitive assessment tests cognitive function or the thinking and reasoning parts of the brain (medial temporal lobe and front lobe). The Zurich Consensus Statement confirms that "The application of NP testing in concussion has been shown to be of clinical value and continues to contribute significant information in concussion evaluation." The neurocognitive assessment should include a combination of paper-and-pencil and computer-based testing. The testing can be carried out by a trained technician. If the test results are abnormal however, the results would need to be interpreted by a neuropsychologist.

336. First, standard paper and pencil neuropsychological tests have proven useful for identifying cognitive deficits resulting from concussions. The tests are designed to assess various domains of cognitive functioning such as short-term memory, working memory, attention, concentration, visual spatial capacity, information processing speed, and reaction time. The tests assist in quantifying the severity of the brain injury. The paper-and-pencil tests can take approximately an hour to administer. The standard tests that would be used include:<sup>238</sup>

<b>Neuropsychological Test</b>	<b>Cognitive Domain</b>
Controlled Oral Word Association	Verbal Fluency

Hopkins Verbal Learning Test	Verbal learning, immediate and delayed memory
Trail Making: Parts A and B	Visual scanning, attention, information processing speed, psychomotor speed
Wechsler Letter Number Sequencing Test	Verbal working memory
Wechsler Digit Span: Digits Forward and Digits Backward	Attention, concentration
Symbol Digit Modalities Test	Psychomotor speed, attention, concentration
Paced Auditory Serial Addition Test	Attention, concentration
Stroop Color Word Test	Attention, information processing speed

337. Second, a computer-generated neuropsychological test program would be used. Examples that could be used include, among others: Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) developed at the University of Pittsburgh Medical Center,<sup>239</sup> or the Concussion Resolution Index (CRI) developed by HeadMinder, Inc. of New York, NY.<sup>240</sup> The NATA 2004 Position Statement recommends that a licensed psychologist, preferably board-certified in clinical neuropsychology or with clinical experience in evaluating sport-related concussions, oversee and supervise the testing. The Zurich Consensus Statement also provides that: “Neuropsychologists are in the best position to interpret NP tests by virtue of their background and training.”

338. The most widely-used test, the ImPACT test can be completed in twenty minutes and is given almost everywhere. ImPACT then tabulates the results in tables and charts and generates a neurocognitive profile so extensive that it covers six pages.

339. ImPACT comprises four parts. Part one covers demographics and health history. Part two asks the test taker for information about symptoms and other conditions related to previous concussions. These questions include the date of the test taker’s most recent concussion (if any), the hours slept the previous night, and the names of prescription medicines he is currently taking. If the young athlete is experiencing concussion symptoms – twenty-two are listed – the symptoms and their severity are noted.

340. Part three – the true evaluation – is the neurocognitive test. This section consists of six “modules,” or exercises designed to test different thinking parts of the brain. “Word Discrimination” measures powers of attention and what’s referred to as verbal recognition memory, which is the ability to recall verbal information. In this part, twelve words flash fleetingly on the screen. That list is followed by another list made up of a few words from the

previous list mixed in with some different ones. The goal is to pick out those repeating words, no easy task considering how briefly the test subject got to see them.

341. In “Color Match,” the test reaction time is being measured, along with impulse control and response inhibition. A color word appears on the screen in that same color (the word *blue* in the color blue). Other times, the word is presented in a different color (the word *blue* in the color red). The test subject responds as quickly as she can to what she sees, clicking “correct” when the color and the word correspond and “incorrect” when they don’t.

342. Likewise, “Design Memory” evaluates visual memory and attention using shapes and designs (unlike “Word Discrimination,” which tests the same only using words). “Xs and Os” is a test of visual memory and processing speed. “Symbol Match” looks at visual processing speed, learning, and memory, and “Three Letter Memory” grades memory and visual-motor response speed.

343. If the results of the neurocognitive testing are below normative data, the results must be interpreted by a neuropsychologist.

#### 4. Results

344. All of the information gathered from the above tests would be collectively evaluated by the physician skilled in the diagnosis, treatment and management of concussions and the results and/or diagnosis communicated to the student athlete. Moreover, at each follow-up examination, the student-athlete’s status will be compared to the baseline or prior results, thus providing the physician with crucial information regarding deterioration or new symptoms of which the student-athlete may not otherwise be aware.

345. Armed with the results and/or diagnosis, the student athlete will then be in a position to seek treatment appropriate to the diagnosis and be knowledgeable about the effects, if any, of concussions or subconcussive hits sustained at NCAA schools.

346. Based on my experience and the consensus in the medical and scientific communities, it is my opinion that the above medical monitoring program meets the standard of care and/or is best practice for the assessment and diagnosis of individuals that have played contact sports at NCAA member institutions.

347. It is also my opinion, based on the NCAA injury data, that thousands of athletes have suffered concussions and subconcussive hits while playing NCAA sports and have done so under the NCAA’s inadequate Concussion Management Plan. In these circumstances a medical monitoring program is appropriate.

## XII. CONCLUSION

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated: July 17, 2013



ROBERT C. CANTU, M.A., M.D., F.A.C.S., F.A.C.S.M.

<sup>1</sup> B.E. Gavett, R.A. Stern & A.C. McKee, *Chronic Traumatic Encephalopathy: A Potential Late Effect of Sport-Related Concussive and Subconcussive Head Trauma*, 30 CLINICAL SPORTS MED. 179 (2011) (“Gavett et al., 2011”); A.C. McKee et al., *Chronic Traumatic Encephalopathy in Athletes: Progressive Tauopathy After Repetitive Head Injury*, 68 J. NEUROPATHOLOGY EXPERIMENTAL NEUROLOGY 709 (2009) (“McKee et al., 2009”).

<sup>2</sup> T.M. Talvage, et al., *Functionally-Detected Cognitive Impairment in High School Football Players Without Clinically-Diagnosed Concussion*, J. NEUROTRAUMA (published online ahead of print, Apr. 11, 2013) (Talvage et al., 2010).

<sup>3</sup> Talvage et al., 2010.

<sup>4</sup> Gavett et al., 2011.

<sup>5</sup> K.M. Guskiewicz et al., *Association Between Recurrent Concussion and Late-Life Cognitive Impairment in Retired Professional Football Players*, 57 NEUROSURGERY 719 (2005).

<sup>6</sup> K.M. Guskiewicz et al., *Recurrent Concussion and Risk of Depression in Retired Professional Football Players*, 39 MED. SCI. SPORTS EXERCISE 903 (2007a).

<sup>7</sup> R.L. Saunders & R.E. Harbaugh, *Second Impact in Catastrophic Contact-Sports Head Trauma*, 252 JAMA 538 (1984).

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<sup>9</sup> R.C. Cantu, *Second Impact Syndrome: Immediate Management*, 20 PHYSICIAN SPORTSMED. 55 (1992).

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<sup>15</sup> L.R. Gentry, J.C. Godersky, B. Thompson & V.D. Dunn, *Prospective Comparative Study of Intermediate Field MR and CT in Evaluation of Closed Head Trauma*, 150 AM. J. ROENGENOLOGY 673 (1988).

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<sup>17</sup> T. Mori, Y. Katayama & T. Kawamata, *Acute Hemisphere Swelling Associated with Thin Subdural Hematomas: Pathophysiology of Repetitive Head Injury in Sports*, 96 ACTA NEUROCHIRURGICA 40 (Suppl. 2006) (Eur.).

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<sup>26</sup> A.C. McKee et al., *The Spectrum of Disease in Chronic Traumatic Encephalopathy*, 136 BRAIN 43 (2013, first published online Dec. 2, 2012).

<sup>27</sup> NCAA10022589-93.

<sup>28</sup> NCAA00002934-61.

<sup>29</sup> *Id.* at NCAA00002937.

<sup>30</sup> *Id.* at NCAA00002938.

<sup>31</sup> *Id.* at NCAA00002937.

<sup>32</sup> NCAA00002962-80.

<sup>33</sup> *Id.* at NCAA00002980.

<sup>34</sup> *Id.* at NCAA00002977.

<sup>35</sup> *Id.* at NCAA00002976.

<sup>36</sup> NCAA00003000-19.

<sup>37</sup> *Id.* at NCAA00003017.

<sup>38</sup> NCAA00003351-59, at NCAA00003356.

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<sup>39</sup> NCAA00003370-80, at NCAA00003371, NCAA00003374.

<sup>40</sup> NCAA00003381-94, at NCAA00003386.

<sup>41</sup> NCAA00003395-402, at NCAA00003399.

<sup>42</sup> NCAA00003403-11, at NCAA00003407, NCAA00003410.

<sup>43</sup> NCAA00003412-18, at NCAA00003416, NCAA00003417.

<sup>44</sup> NCAA00003419-26, at NCAA00003423.

<sup>45</sup> NCAA00003427-35, at NCAA00003431.

<sup>46</sup> NCAA00003436-44, at NCAA00003440, NCAA00003441, NCAA00003443.

<sup>47</sup> NCAA00003445-53, at NCAA00003449, NCAA00003451, NCAA00003452.

<sup>48</sup> NCAA00003455-63, at NCAA00003458.

<sup>49</sup> NCAA00003464-72, at NCAA00003468.

<sup>50</sup> NCAA00003473-81, at NCAA00003477.

<sup>51</sup> NCAA00007964-66 at NCAA00007964.

<sup>52</sup> NCAA00014606-09.

<sup>53</sup> P.S. Echlin et al., *A Prospective Study of Physician-Observed Concussions During Junior Ice Hockey: Implications for Incidence Rates*, 29 NEUROSURGICAL FOCUS E4 (2010).

<sup>54</sup> NCAA10056396-99, at NCAA10056396.

<sup>55</sup> NCAA00007931-32, at NCAA00007931; NCAA00007854.

<sup>56</sup> NCAA Const., Art. 1, § 1.3.2.

<sup>57</sup> NCAA Const., Art. 2, § 2.8.2.

<sup>58</sup> Health and Safety Overview, <http://www.ncaa.org/wps/wcm/connect/public/NCAA/Health+and+Safety/index.html> (last visited June 14, 2013).

<sup>59</sup> Sports Injuries, <http://www.ncaa.org/wps/wcm/connect/public/NCAA/Health+and+Safety/Sports+Injuries> (last visited June 14, 2013).

<sup>60</sup> NCAA10107716-19, at NCAA10107716.

<sup>61</sup> Sports Injuries, <http://www.ncaa.org/wps/wcm/connect/public/NCAA/Health+and+Safety/Sports+Injuries> (last visited June 14, 2013).

<sup>62</sup> NCAA00016590-708, at NCAA00016592.

<sup>63</sup> *Id.* at NCAA00016594 (emphasis added).

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<sup>64</sup> *Id.*

<sup>65</sup> M. Aubry et al., *Summary and Agreement Statement of the First International Conference on Concussion in Sport, Vienna 2001*, 36 BRIT. J. SPORTS MED. 6 (2002) (“Vienna Protocol”).

<sup>66</sup> P. McCrory et al., *Summary and Agreement Statement of the 2nd International Conference in Concussion in Sport, Prague 2004*, 39 BRIT. J. SPORTS MED. 196 (2005) (“Prague Protocol”).

<sup>67</sup> P. McCrory et al., *Consensus Statement on Concussion in Sport: The 3rd International Conference on Concussion in Sport held in Zurich*, 43 BRIT. J. SPORTS MED., i76, i78 (2009) (“Zurich Protocol”).

<sup>68</sup> K.M. Guskiewicz et al., *National Athletic Trainers’ Association Position Statement: Management of Sport-Related Concussion*, 39 J. ATHLETIC TRAINING 280 (2004) (“NATA 2004 Statement”).

<sup>69</sup> American College of Sports Medicine, *Concussion (Mild Traumatic Brain Injury) and the Team Physician: A Consensus Statement*, MED. SCI. SPORTS & EXERCISE, 395, 396 (2006).

<sup>70</sup> Press Release, *NFL Outlines Standards for Concussion Management* (May 22, 2007), available at [http://www.nflevolution.com/wordpress/wp-content/uploads/2012/08/concussion\\_standards-508.pdf](http://www.nflevolution.com/wordpress/wp-content/uploads/2012/08/concussion_standards-508.pdf); NCAA10044661-62.

<sup>71</sup> Press Release, *NFL Outlines Standards for Concussion Management* (May 22, 2007), available at [http://www.nflevolution.com/wordpress/wp-content/uploads/2012/08/concussion\\_standards-508.pdf](http://www.nflevolution.com/wordpress/wp-content/uploads/2012/08/concussion_standards-508.pdf).

<sup>72</sup> See Press Release, *NFL Outlines For Players Steps Taken to Address Concussions* (Aug. 14, 2007), available at <http://www.nfl.com/news/story/09000d5d8017cc67/article/nfl-outlines-for-players-steps-taken-to-address-concussions>.

<sup>73</sup> Zurich Protocol, at i78.

<sup>74</sup> See Press Release, *NFL Adopts Stricter Statement on Return-to-Play Following Concussions* (Dec. 2, 2009), available at [http://www.nflevolution.com/wordpress/wp-content/uploads/2012/08/nfl\\_adopts\\_stricter\\_statement\\_on\\_return-to-play\\_following\\_concussions-508.pdf](http://www.nflevolution.com/wordpress/wp-content/uploads/2012/08/nfl_adopts_stricter_statement_on_return-to-play_following_concussions-508.pdf); see also NCAA10044661-62.

<sup>75</sup> *NFL Launches New Guidelines for Assessing Concussions*, USA TODAY (Mar. 30, 2011), available at [http://usatoday30.usatoday.com/sports/football/nfl/2011-03-29-concussions-protocol\\_N.htm](http://usatoday30.usatoday.com/sports/football/nfl/2011-03-29-concussions-protocol_N.htm).

<sup>76</sup> Judy Battista, *NFL Will Expand Concussion Efforts During Games*, N.Y. TIMES (Feb. 26, 2013), available at [http://www.nytimes.com/2013/02/27/sports/football/nfl-will-use-ipads-to-expand-in-game-concussion-testing.html?ref=judybattista&\\_r=0](http://www.nytimes.com/2013/02/27/sports/football/nfl-will-use-ipads-to-expand-in-game-concussion-testing.html?ref=judybattista&_r=0).

<sup>77</sup> *Id.*

<sup>78</sup> American College of Sports Medicine, *Concussion (Mild Traumatic Brain Injury) and the Team Physician: A Consensus Statement - 2011 Update*, MED. SCI. SPORTS & EXERCISE 2412, 2415 (2011).

<sup>79</sup> American College of Sports Medicine, *The Team Physician and the Return-to-Play Decision: A Consensus Statement - 2012 Update*, MED. SCI. SPORTS & EXERCISE 2446, 2447 (2012).

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<sup>80</sup> American Academy of Neurology, *Summary of Evidence-Based Guideline Update: Evaluation and Management of Concussion in Sports* (2013), available at <http://neurology.org/content/early/2013/03/15/WNL.0b013e31828d57dd>.

<sup>81</sup> *Id.* at 3.

<sup>82</sup> *Id.* (citations omitted).

<sup>83</sup> *Id.*

<sup>84</sup> *Id.* at 4.

<sup>85</sup> *Id.*

<sup>86</sup> *Id.* at 5.

<sup>87</sup> *Id.*

<sup>88</sup> *Id.* at 6.

<sup>89</sup> P. McCrory et al., *Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012*, 47 BRIT. J. SPORTS MED. 250 (2013), available at <http://bjsm.bmjjournals.com/content/47/5/250.full.pdf+html>.

<sup>90</sup> *Id.*

<sup>91</sup> *Id.* at 5.

<sup>92</sup> *Id.* at 3.

<sup>93</sup> *Id.*

<sup>94</sup> *Id.*

<sup>95</sup> *Id.* at 4.

<sup>96</sup> *Id.* at 5.

<sup>97</sup> *Id.* at 7-8.

<sup>98</sup> *Id.* at 5.

<sup>99</sup> See e.g., NCAA10139563-638, at NCAA10139602-05.

<sup>100</sup> See e.g., NCAA10140071-156, NCAA10140116-19.

<sup>101</sup> See e.g., NCAA00007589-7710, at NCAA00007642-47.

<sup>102</sup> See NCAA10055897 (email authored by David Klossner admitting that the NCAA does not, and has no plans to, audit member institution concussion management plans).

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<sup>103</sup> NCAA00007461-588, at NCAA00007513-16.

<sup>104</sup> See, e.g., NCAA00007098-213, at NCAA00007144-47.

<sup>105</sup> NCAA00012568-682, NCAA00012613-16.

<sup>106</sup> The Handbooks merely noted that “[T]he sideline evaluation should also include a neurological and mental status examination and some form of brief neurocognitive testing to assess memory function and attention. This can be in the form of questions regarding the particular practice or competition, previous game results, and remote and recent memory, as well as questions to test the athlete’s recall of words, months of the year backwards and calculations.” *Id.* at NCAA00012614. This vague recommendation does not explain that standard orientation questions are unreliable in the sporting situation. Vienna Protocol at 7 (“It is worth noting that standard orientation questions – for example, time, place, person – have been shown to be unreliable in the sporting situation compared with memory assessment.”).

<sup>107</sup> In regards to injury prevention, the NCAA did modify its “spearing” rule in 2005 and created limited educational materials to educate football players on proper tackling techniques. However, the results of the rule change did not necessarily lead to stricter enforcement of penalties or to a reduction in head injuries despite the Prague Protocol’s identification of proper rule enforcement as a critical aspect of such approaches. See NCAA00002866-NCAA00002867 (May 10, 2006 USA Today article circulated internally at the NCAA noting that in all of Division I-A and I-AA football in the 2005 season, the year after the “spearing” rule was changed to eliminate the word “intentional,” there were only “21 penalties for spearing and 21 penalties for the related offense of using the helmet to butt or ram an opponent.”).

<sup>108</sup> NCAA10140278.

<sup>109</sup> NCAA10089308.

<sup>110</sup> *Ron Courson Testimony at Congressional Forum*, THE NCAA NEWS (Feb. 23, 2010), available at [http://fs.ncaa.org/Docs/NCAANewsArchive/2010/aWide/ron\\_courson\\_testimony\\_at\\_congressional\\_forum.html](http://fs.ncaa.org/Docs/NCAANewsArchive/2010/aWide/ron_courson_testimony_at_congressional_forum.html) (last accessed June 13, 2012)

<sup>111</sup> NCAA00015153-54, at NCAA00015154.

<sup>112</sup> NCAA00007936.

<sup>113</sup> NCAA00014046-47.

<sup>114</sup> NCAA00014766-67, at NCAA00014766.

<sup>115</sup> NCAA10056396-99, at NCAA10056397.

<sup>116</sup> *Id.* at NCAA10056396.

<sup>117</sup> NCAA10068879-922, at NCAA10068883.

<sup>118</sup> NCAA10101404-09, at NCAA10101404.

<sup>119</sup> NCAA 10068879-922, at NCAA10068896.

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<sup>120</sup> *Id.* at NCAA10068898.

<sup>121</sup> *Id.* at NCAA10068900.

<sup>122</sup> *Id.* at NCAA10068904.

<sup>123</sup> *Id.* at NCAA10068907.

<sup>124</sup> NCAA10101405-09, at NCAA10101406.

<sup>125</sup> *Id.*

<sup>126</sup> *Id.* at NCAA10101407.

<sup>127</sup> NCAA10068879-922, at NCAA10068909.

<sup>128</sup> *Id.* at NCAA10068910.

<sup>129</sup> *Id.* at NCAA10068911.

<sup>130</sup> *Id.*

<sup>131</sup> NCAA10101405-09, at NCAA10101406.

<sup>132</sup> NCAA10068879-922, at NCAA10068911.

<sup>133</sup> *Id.*

<sup>134</sup> NCAA00013976-99.

<sup>135</sup> NCAA00013981.

<sup>136</sup> IVY000120-23.

<sup>137</sup> NATA 2004 Statement.

<sup>138</sup> ARRINGTON-EIU00000512-13, at ARRINGTON-EIU00000512.

<sup>139</sup> ARRINGTON-EIU00000841.

<sup>140</sup> ARRINGTON-EIU00000838.

<sup>141</sup> ARRINGTON-EIU00000655; ARRINGTON-EIU00000714-15, at ARRINGTON-EIU 00000714. *See also* ARRINGTON-EIU00000656 (diagnosis of “Multiple Concussions” by Dr. Karl Rudert).

<sup>142</sup> ARRINGTON-EIU00000714-15, at ARRINGTON-EIU00000715.

<sup>143</sup> ARRINGTON-EIU00000431; ARRINGTON-EIU00000657.

<sup>144</sup> During an examination by Dr. Aja Lystilla, Arrington reported:

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that he had confusional confusion [sic] all day on the date of November 15, 2008 with no known mechanism. He has had no direct blow. He had confusion before the game started and then was removed from the game in the first quarter. He remembers parts of the game, but does not remember going to walkthrough. He has had a history of two previous concussions April of 2007 and October of 2007 with similar symptoms, but had no symptoms on November 16, 2008 or today.

ARRINGTON-EIU00000658.

<sup>145</sup> ARRINGTON-EIU00000714-15, at ARRINGTON-EIU00000715.

<sup>146</sup> ARRINGTON-EIU00000424.

<sup>147</sup> ARRINGTON-EIU00000673.

<sup>148</sup> ARRINGTON-EIU00000714-15, at ARRINGTON-EIU715.

<sup>149</sup> ARRINGTON-EIU00000674-76, at ARRINGTON-EIU00000674.

<sup>150</sup> ARRINGTON-EIU00000684.

<sup>151</sup> ARRINGTON-EIU00000687; ARRINGTON-EIU714-15, at ARRINGTON-EIU00000714.

<sup>152</sup> According to an EIU “Injury Report” signed by an athletic trainer:

Adrian reported to the training room to complete his ankle rehab[, reporting] that teammates had said that he was at times ‘unresponsive’ and ‘sweating’ during the lifting workout that morning...a few hours later, I received a phone call from his roommate stating that he was going to bring Adrian back to the training room because he again was having a confusional episode’ once Adrian arrived, I confirmed the confusional state and took him to Carle clinic to see Dr. Lystila...while Adrian and I were waiting in the patient room...he had another “episode”...Dr. Lystila was immediately brought back into the room and he returned back to normal.

ARRINGTON-EIU00000714-15, at ARRINGTON-EIU00000715.

<sup>153</sup> Levetiracetam, marketed under the trade name Keppra, is an anticonvulsant medication used to treat epilepsy. Levetiracetam (Keppra) for Epilepsy, Medify, <https://www.medify.com/treatments-conditions/levetiracetam-treatment-epilepsy> (last visited June 14, 2013).

<sup>154</sup> Lorazepam, marketed under the trade name Ativan, is a high-potency, short- to intermediate-acting, 3-hydroxy benzodiazepine drug that has all six intrinsic benzodiazepine effects: anxiolytic, amnesic, sedative/hypnotic, anticonvulsant, antiemetic and muscle relaxant. Lorazepam is used for the short-term treatment of anxiety, insomnia, acute seizures including status epilepticus and sedation of hospitalized patients, as well as sedation of aggressive patients. Lorazepam, Side Effects Directory, <http://sideeffectsdirectory.com/orazepam-side-effects> (last visited June 14, 2013).

<sup>155</sup> ARRINGTON-EIU688-89, at ARRINGTON-EIU00000688.

<sup>156</sup> ARRINGTON-EIU00000692-93, at ARRINGTON-EIU00000692; ARRINGTON-EIU00000694; ARRINGTON-EIU695-99, at ARRINGTON-EIU00000695.

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<sup>157</sup> According to ARRINGTON-EIU00000707-08, at ARRINGTON-EIU00000708, Adrian stated to Dr. Bremer “that with the July 12-13, 2009, episode, that he was told that a TV fell on his head and cause the bruising.”

<sup>158</sup> ARRINGTON-EIU00000695-99.

<sup>159</sup> ARRINGTON-EIU00000704.

<sup>160</sup> ARRINGTON-EIU00000700-01, at ARRINGTON-EIU00000700.

<sup>161</sup> ARRINGTON000002-03, at ARRINGTON000002.

<sup>162</sup> ARRINGTON-EIU00000707.

<sup>163</sup> ARRINGTON-EIU707-08, at ARRINGTON-EIU00000707.

<sup>164</sup> ARRINGTON-EIU714-15, at ARRINGTON-EIU00000714.

<sup>165</sup> *Id.* See also ARRINGTON-SBL0000111-12, at ARRINGTON-SBL0000111.

<sup>166</sup> ARRINGTON-BREMER00000045-46, at ARRINGTON-BREMER00000045.

<sup>167</sup> ARRINGTON000084-86.

<sup>168</sup> As late as March 2012, EIU admitted that “[t]he place where we are deficient at this time is having a physician to consult for the need for referral and return to play.” ARRINGTON-EIU2000087.

<sup>169</sup> OWENS-UCA40-41, at OWENS-UCA0000040; OWENS-UCA2000017-19, at OWENS2000017.

<sup>170</sup> Owens Resp. Interrog. No. 1; OWENS-UCA000007-08, at OWENS-UCA0000008.

<sup>171</sup> OWENS-UCA0000007-08.

<sup>172</sup> *Id.* at OWENS-UCA0000007.

<sup>173</sup> OWENS-UCA0000007-08.

<sup>174</sup> Owens Resp. Interrog. No. 1.

<sup>175</sup> OWENS003618; Owens Resp. Interrog. No. 2.

<sup>176</sup> OWENS-UCA0000007-08, at OWENS-UCA0000008.

<sup>177</sup> OWENS-UCA0000007-08.

<sup>178</sup> *Id.* at OWENS-UCA0000008.

<sup>179</sup> OWENSUCA0000007-08.

<sup>180</sup> Owens Resp. Interrog. No. 1.

<sup>181</sup> OWENS-UCA0000007-08.

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<sup>182</sup> *Id.* at OWENS-UCA0000008.

<sup>183</sup> OWENS-UCA0000007-08, OWENS-UCA0000053.

<sup>184</sup> OWENS-UCA0000007-08, at OWENS-UCA0000008.

<sup>185</sup> OWENS000004.

<sup>186</sup> OWENS-UCA0000075.

<sup>187</sup> OWENS-UCA0000011.

<sup>188</sup> OWENS-UCA0000012.

<sup>189</sup> OWENSUCA0000048-49, OWENSUCA20000017-19; OWENS-UCA2000019.

<sup>190</sup> OWENS-UCA0000050; OWENS-UCA2000019; OWENS000340.

<sup>191</sup> Owens Resp. Interrog. No. 1.

<sup>192</sup> OWENS000739.

<sup>193</sup> Owens Resp. Interrog. No. 2.

<sup>194</sup> OWENS000006-07.

<sup>195</sup> OWENS000008-10.

<sup>196</sup> OWENS-UCA0000002.

<sup>197</sup> OWENS000001-03.

<sup>198</sup> Owens Resp. Interrog. No. 2.

<sup>199</sup> OWENS-JOHNSON0000005.

<sup>200</sup> OWENS-MHC0000022-23, at OWENS-MHC22; OWENS-JOHNSON0000002-04, at OWENS-JOHNSON0000003-04.

<sup>201</sup> PALACIOS-OBU0000072-76, at PALACIOS-OBU0000072, Palacios Resp. Interrog. No. 2; PALACIOS-ARCHER0000014-15, PALACIOS-ARCHER0000052.

<sup>202</sup> Palacios Resp. Interrog. No. 2; PALACIOS-OBU0000058-61, at PALACIOS-OBU0000059.

<sup>203</sup> Palacios Resp. Interrog. No. 3.

<sup>204</sup> PALACIOS-OBU0000087-90.

<sup>205</sup> PALACIOS-OBU0000042.

<sup>206</sup> *Id.*

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<sup>207</sup> *Id.*

<sup>208</sup> PALACIOS-OBU0000043-47; Palacios Resp. Interrog. No. 2.

<sup>209</sup> “The Cognitive efficiency Index measures the interaction between accuracy percentage correct and speed (reaction time) in seconds on the Symbol Match test. This score was not developed to make return to play decisions but can be helpful in determining the extent to which the athlete tried to work very fast on symbol match decreasing accuracy or attempted to improve their accuracy by taking more deliberate and slow approach (jeopardizing speed). The range of scores Is from approximately zero to approximately .70 with mean of .34. A higher score indicates that the athlete did well in both the speed and memory domains on the symbol match test. A low score (below .20) means that they performed poorly on both the speed and accuracy component. If this score is negative number the test taker performed very poorly on the reaction time component.” PALACIOS-OBU0000043-47, at PALACIOS-OBU0000044.

<sup>210</sup> PALACIOS-OBU0000042.

<sup>211</sup> *Id.*

<sup>212</sup> PALACIOS-KLUCK0000010.

<sup>213</sup> Palacios Resp. Interrog. No. 2.

<sup>214</sup> Palacios Resp. Interrog. No. 2; PALACIOS-OBU0000042.

<sup>215</sup> According to trainer notes for September 17, 2011:

Athlete was able to open her eye. Vision was normal. She was asked to run as part of her re-introduction to practice. Athlete suddenly states that she has had headache for the past days since Monday. Ashley graduate-assistant then called Katelyn, Assistant Athletic trainer, to discuss options. Since the athlete’s headache started before her injury and no symptoms have developed since the initial injury the athlete was told to run and that if her headache worsened she was to immediately stop. The athlete had to go to her dorm to get clothes and shoes to run in. When she returned to practice she stretched then ran one lap around the field. At this point the coach told her to sit down after getting off the phone with the athlete’s mother. Sometime after practice the athletes mother advises her to come home.

PALACIOS-OBU0000042.

<sup>216</sup> PALACIOS-KLESMIT0000002-05; PALACIOS-KLESMIT0000006-07; PALACIOS-KLESMIT0000008.

<sup>217</sup> Palacios Resp. Interrog. No. 5.

<sup>218</sup> PALACIOS-MANSFIELD0000034-37; PALACIOS-MANSFIELD0000047-59, at PALACIOS-MANSFIELD0000059.

<sup>219</sup> Palacios Resp. Interrog. No. 5.

<sup>220</sup> Solomon’s Response to Interrogatory No. 1; SOLOMON-LAWRENCE0000013; SOLOMON000425.

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<sup>221</sup> SOLOMON-UMAINE0000044-46, at SOLOMON-UMAINE0000044.

<sup>222</sup> SOLOMON-UMAINE0000105-111, at SOLOMON-UMAINE0000105.

<sup>223</sup> SOLOMON-UMAINE0000171.

<sup>224</sup> SOLOMON-UMAINE0000105.

<sup>225</sup> SOLOMON-UMAINE0000184.

<sup>226</sup> Solomon Resp. Interrog. No. 1.

<sup>227</sup> SOLOMON-UMAINE0000166.

<sup>228</sup> SOLOMON-UMAINE0000135-155, at SOLOMON-UMAINE0000135.

<sup>229</sup> SOLOMON-UMAINE0000126-27, at SOLOMON-UMAINE0000126; SOLOMON-UMAINE0000128.

<sup>230</sup> SOLOMON-LAWRENCE0000071.

<sup>231</sup> SOLOMON-UMAINE0000176-78, at SOLOMON-UMAINE0000176.

<sup>232</sup> SOLOMON-UMAINE0000105-111, at SOLOMON-UMAINE0000105.

<sup>233</sup> Plaintiff's Resp. Interrog. Nos. 1, 3.

<sup>234</sup> SOLOMON000002-6; SOLOMON000007-9; SOLOMON000010-12; SOLOMON000013.

<sup>235</sup> SOLOMON-UMAINE0000264; SOLOMON-UMAINE0000262; SOLOMON-UMAINE0000263.

<sup>236</sup> King Devick Test, <http://kingdevicktest.com> (last visited June 14, 2013).

<sup>237</sup> T.N. Hunt, M.S. Ferrara, R.A. Bornstein & T.A. Baumgartner, *The Reliability of the Modified Balance Error Scoring System*, 19 CLINICAL J. SPORT MED. 471 (2009).

<sup>238</sup> NATA 2004 Statement.

<sup>239</sup> This test is publicly available at \$20 per test. See Pricing, <http://impacttest.com/purchase/price> (last visited June 14, 2013).

<sup>240</sup> This test is publicly available at \$25 per test. See Pricing, <http://www.headminder.com/site/cri/pricing.html> (last visited June 14, 2013).

*Arrington v. NCAA*, Case No. 11-cv-06356

APPENDIX A

**CURRICULUM VITAE**

**ROBERT CLARK CANTU, M.A., M.D., FACS, FAANS, FICS, FACSM**

**NAME:** Robert Clark Cantu, MA, M.D., F.A.C.S., F.A.A.N.S., F.I.C.S., F.A.C.S.M.  
**DATE OF BIRTH:** August 31, 1938  
**BIRTHPLACE:** Santa Rosa, California  
**PRESENT POSITIONS:** Chief, Neurosurgery Service, Chairman Department of Surgery  
 Director, Service of Sports Medicine  
Emerson Hospital, Concord, MA 01742  
 Telephone: 1-978-369-1386  
 Facsimile: 1-978-287-0047

**Clinical Professor Neurology and Neurosurgery, Boston University School of Medicine, Co-Director Center for The Study of Traumatic Encephalopathy (CSTE), Boston University Medical Center, Boston, MA**  
**Senior Advisor to NFL's Head, Neck and Spine Committee**  
**Member/Co-Chair Equipment and Rules Committee NFLPA Mackey/White TBI Committee**  
**Adjunct Staff Department Neurosurgery, Senior Advisor Brain Injury Center Children's Hospital Boston, Boston, MA**  
**Adjunct Professor, Exercise and Sport Science, University North Carolina, Chapel Hill, NC**  
**Medical Director, National Center for Catastrophic Sports Injury Research, Chapel Hill, NC**  
**Clinical Instructor in Pediatrics, Boston University School of Medicine**  
**Neurosurgical Consultant Boston College Eagles football team**  
**Co-Director, Neurologic Sports Injury Center at Brigham and Women's Hospital, Boston, MA**  
**Founding Member and Chairman Medical Advisory Board Sports Legacy Institute (SLI), Waltham, MA**

**EDUCATION:** 1960 B.A. University of California, Berkeley  
 1962 M.A. University of California, San Francisco  
 1963 M.D. University of California, San Francisco

#### PROFESSIONAL EXPERIENCE:

1963 - 1964	<b>Intern in Surgery</b> , Columbia-Presbyterian Hospital, New York, NY
1964 - 1967	<b>Assistant Resident in Neurosurgery</b> , Massachusetts General Hospital
1964 - 1967	<b>Research Fellow in Physiology</b> , Harvard Medical School
1967 - 1968	<b>Chief Resident in Neurosurgery</b> , Boston City Hospital
1967 - 1968	<b>Teaching Fellow in Surgery</b> , Harvard Medical School
1967 - 1968	<b>Clinical Assistant in Neurosurgery</b> , Massachusetts General Hospital
1968 - 1973	<b>Clinical and Research Fellow in Neurosurgery</b> , Massachusetts General Hospital
1968 - 1969	<b>Assistant in Surgery</b> , Harvard Medical School
1969 - 1973	<b>Instructor in Surgery</b> , Harvard Medical School
1968 - 1970	<b>Acting Assistant Director Neurosurgery</b> , Boston City Hospital
1968 - 1970	<b>Director of Pediatric Neurosurgery</b> , Boston City Hospital
1968 - 1973	<b>Clinical Associate in Neurosurgery</b> , Massachusetts General Hospital
1968 -	<b>Chief of Neurosurgery Service</b> , Emerson Hospital, Concord, MA
1970 - 1995	<b>Neurosurgical Consultant</b> , Cutler Army Hospital, Fort Devens, MA
1970 - 1975	<b>Neurosurgical Consultant</b> , Nashoba Community Hospital, Ayer, MA
1976 - 1978	<b>Chief of Neurosurgery Service</b> , Nashoba Community Hospital, Ayer, MA
1979 - 1980	<b>Chairman, Department of Surgery</b> , Emerson Hospital, Concord, MA
1980 -	<b>Director, Service of Sports Medicine</b> , Emerson Hospital, Concord, MA
1989 - 1991	<b>Chairman, Department of Surgery</b> , Emerson Hospital, Concord, MA
1989 -	<b>Medical Director</b> , National Center for Catastrophic Sports Injury Research
1991 - 1993	<b>Board of Trustees</b> , Emerson Hospital, Concord, MA
1991 - 1993	<b>Director</b> , Emerson Health System, Inc.
1992 - 1993	<b>President</b> , American College of Sports Medicine
1994 -	<b>Clinical Instructor in Pediatrics</b> , Boston University School of Medicine

1994 -	<b>Board of Trustees</b> , National Operating Committee on Standards For Athletic Equipment (NOCSAE)
1996 -	<b>Vice-President</b> , National Operating Committee on Standards for Athletic Equipment (NOCSAE)
1994 -	<b>Board of Advisors</b> , National Youth Sports Foundation for the Prevention of Athletic Injuries, Inc.
1998 - 2000	<b>Scientific Advisory Panel on Sports Medicine</b> , Knoll Pharmaceutical Company
1998 - 2000	<b>Advisory Committee for Injury Prevention</b> , Centers For Disease Control, Atlanta, GA
2000 -	<b>Executive Committee Joint Section on Neurotrauma</b> ,
	Congress Neurological Surgeons/American Association Neurological Surgeons
2002 - 2005	<b>Editorial Board</b> , Journal of Athletic Training
2001 -	<b>Co-Chairman</b> , NASCAR Safety Task Force, American College Sports Medicine, Indianapolis, IN
2002 -	<b>Editorial Board</b> , Current Sports Medicine Reports
2002 -	<b>Editorial Board</b> , American Journal of Medicine & Sports
2002 -	<b>Neurosurgical Consultant</b> , Boston College Eagles football team
2003-2010	<b>Neurosurgical Consultant</b> , Boston Cannons professional Lacrosse team
2003 -	<b>Editorial Board Principal Sports, Neurosurgery</b>
2003-	<b>Adjunct Appointment</b> , Brigham and Women's Hospital, Boston, MA
2004-2010	<b>Chairman, Department of Surgery</b> , Emerson Hospital Concord, MA
2005-	<b>Board of Directors</b> , Massachusetts Brain Injury Association, Westborough, MA
2007-	<b>Medical Advisory Board of the State Boxing Commission</b> , Boston, MA
2007 -	<b>Founding Member and Chairman Medical Advisory Board Sports Legacy Institute (SLI)</b> , Waltham, MA
2007 -	<b>Clinical Professor Neurosurgery</b> , Boston University School of Medicine, Boston, MA
2009 -	<b>Co-Director Center for The Study of Traumatic Encephalopathy (CSTE)</b> , Boston University Medical Center, Boston, MA
2010 -	<b>Senior Advisor to NFL's Head, Neck and Spine Committee</b>
2010-	<b>Fellow of the American Association of Neurological Surgeons (FAANS)</b>
2010 -	<b>Member/Co-Chair Equipment and Rules Committee, NFLPA Mackey/White TBI Committee</b>
2010-	<b>Fellow American Association Neurological Surgeons</b>
2012 -	<b>Adjunct Staff Department Neurosurgery, Senior Advisor Brain Injury Center Children's Hospital Boston</b> , Boston, MA

## SERVICE TO PROFESSIONAL SOCIETIES

### NATIONAL SOCIETIES:

<b>American College of Sports Medicine</b>	1978 -
Board of Trustees	1984 - 1994
Ambassador	1996 - 1999
	1988 -
President-elect:	<b>American College of Sports Medicine</b> , 1991 - 1992
<b>President:</b>	<b>American College of Sports Medicine</b> , 1992 - 1993
Treasurer:	<b>American College of Sports Medicine</b> , 1996 - 1999
Associate Editor:	<u>Medicine and Science in Sports and Exercise</u> , 1986 - 1998
Associate Editor:	<u>Exercise and Sports Science Reviews</u> , 1986 - 2000
Editorial Board:	<u>The Physician and Sportsmedicine</u> , 1989 -
Editorial Board:	<u>Clinical Journal of Sports Medicine</u> , 1991 -
Editorial Board:	<u>Journal Athletic Training</u> , 2000 - 2005
Editorial Board:	<u>Neurosurgery: Sports Section</u> , 2003 -

**American Association of Neurological Surgeons**  
Chairman, Sports Medicine Section, 1985 – 1988

**American Medical Tennis Association**  
Board of Directors, 1984 – 1987

## REGIONAL SOCIETIES:

New England Chapter, American College of Sports Medicine

**Executive Committee:** 1980 - 1982  
**President:** 1981 - 1982  
**Board of Trustees:** 1982 - (Chairman, 1983)

## PROFESSIONAL CONSULTANT:

1983 - 1985                   Advisory editor in sports medicine to The Collamore Press, Lexington, MA  
1984 -                         Technical advisor, Milner-Fenwick Company, Baltimore, MD  
1985 -                         Consultant, United States of America Amateur Boxing Federation, Inc.  
1986 -                         Consultant, Exercycle Corporation, Woonsocket, RI  
1986 - 1988                   Consultant, Reebok Corporation, Avon, MA  
1988 - 1990                   Consultant, Nautilus Company, Independence, VA  
1994 -                         Athletic Advisory Board, Hartwell Medical  
1994 - 2000                   Consultant, NordicTrack, Chaska, MN  
1998 - 2000                   Scientific Advisory Panel on Sports Medicine. Knoll Pharmaceutical Co.  
2000-                         Executive Committee Joint Section on Neurotrauma, Congress Neurological Surgeons/American Association Neurological Surgeons  
2002-2005                   Editorial Board, Journal of Athletic Training  
2002-                         Neurosurgical Consultant to Boston College Eagles football team  
2003-2010                   Neurosurgical Consultant to Boston Cannons professional Lacrosse team  
2003                         Principal – Sports Section, *Neurosurgery*  
2003-                         NOCSAE Consultant to the NFL Concussion Committee  
2004-                         Board of Directors, Massachusetts Brain Injury Association, Westborough, MA  
2007-                         Medical Advisory Board of the State Boxing Commission, Massachusetts  
2007 -                         Founding Member and Chairman Medical Advisory Board Sports Legacy Institute, Waltham, MA

## FELLOWSHIPS:

1975                         **Fellow**, American College of Surgeons  
1981                         **Fellow**, International College of Surgeons  
1981                         **Fellow**, American College of Sports Medicine  
2010                         **Fellow**, American Association Neurological Surgeons (FAANS)

## HONORS AND AWARDS:

California Scholastic Federation Award  
Kraft Award (top twenty freshmen), University of California, Berkeley, 1956-57  
Borden Research Award, 1963  
Microcirculatory Travel Award, 1963  
Candidate Group Prize, Massachusetts Chapter, American College of Surgeons, 1969  
Honor Award in Medicine, New England Chapter, American College of Sports Medicine, 1987  
Distinguished Service Award, American Association for the Improvement of Boxing, 1991  
Rocky Marciano Medical Award, American Association for the Improvement of Boxing, 1995  
Citation Award, American College of Sports Medicine, 1996  
Special Citation Award, New England Chapter, American College Sports Medicine, 2002  
Educator of the Year Award from the American Association of Professional Ringside Physicians 2004  
Dr. Ernst Jokl Sports Medicine Award 2010 from The United States Sports Academy 2010  
Community Clinician of the Year 2013 from The Middlesex Central District Medical Society and The Massachusetts Medical Society

**LICENSES TO PRACTICE MEDICINE:**

By written examination in California, 1963 #: 21223  
By written examination in Massachusetts, 1964 #: 28386

**SPECIALTY BOARD CERTIFICATION:**

American Board of Neurological Surgery, 1970

**MEMBERSHIPS:**

Social Fraternities: Phi Kappa Psi  
Nu Sigma Nu (President, Phi Chapter, 1962-1963)  
Scholastic Fraternities California Scholastic Federation  
Tower and Flame  
Phi Eta Sigma  
Phi Beta Kappa (junior year)  
Alpha Omega Alpha

**PROFESSIONAL SOCIETIES:**

American Academy of Sports Physicians  
American Association for the Advancement of Science  
American Association for the Improvement of Boxing  
American Association of Neurological Surgeons  
American Association of Professional Ringside Physicians  
American Association for the History of Medicine  
American College of Angiography  
American College of Sports Medicine  
American College of Surgeons  
American Federation of Clinical Research  
American Heart Association  
American Medical Association  
American Physiology Society  
American Society for Pharmacology and Experimental Biology  
California (Medical) Alumni Society  
Congress of Neurological Surgeons  
International College of Surgeons  
International Society for Pediatric Neurosurgery  
Massachusetts Medical Benevolent Society  
Massachusetts Medical Society  
Microcirculatory Society  
New England Neurosurgical Society  
North American Spine Society  
Presbyterian Hospital Alumni Society  
Society of Military Surgeons  
Society of Neuroscience

## BACKGROUND SUMMARY

Currently Dr. Cantu's professional responsibilities include those of Clinical Professor Department of Neurosurgery and Co-Director [Center for the Study of Traumatic Encephalopathy, Boston University School of Medicine](#), Boston, MA; Founding member and Chairman Medical Advisory Board [Sports Legacy Institute](#), Waltham, MA; Adjunct Professor Exercise and Sport Science and Medical Director [National Center for Catastrophic Sports Injury Research, University of North Carolina](#), Chapel Hill, NC; Co-Director, [Neurologic Sports Injury Center, Brigham and Women's Hospital](#), Adjunct Staff Department Neurosurgery and Senior Advisor Brain Injury Center [Children's Hospital Boston](#), Boston, MA; Boston, Chief of Neurosurgery Service, Chairman Department of Surgery, and Director of Sports Medicine at [Emerson Hospital](#) in Concord, Massachusetts, Neurosurgical Consultant Boston Eagles football team. He has authored over 378 scientific publications, including 31 books on neurology and sports medicine, in addition to numerous book chapters, peer-reviewed papers, abstracts and free communications, and educational videos. He has served as associate editor of [Medicine and Science in Sports and Exercise](#) and [Exercise and Sports Science Review](#), and on the editorial board of [The Physician and Sports Medicine](#), [Clinical Journal of Sports Medicine](#), and [Journal of Athletic Training](#). In 2003 Dr. Cantu became the section head for the Sports Medicine Section of [Neurosurgery](#).

He grew up in the northern California community of Santa Rosa. In 1960, he received his B.A. degree from the University of California Berkley where he pitched on the varsity baseball team. Jointly, in medical school and graduate school, he received his M.A. degree in endocrinology in 1962, and in 1963, his M.D. from the University of California Medical School in San Francisco. Following a surgical internship at Columbia-Presbyterian Hospital in New York City in 1963-1964, he began a neurosurgery residency at Massachusetts General Hospital in Boston, and simultaneous position of research fellow in physiology at Harvard Medical School. Upon completion of his residency in 1968, he joined the neurosurgery staff at MGH, where his practice and laboratory were located, while assuming the position of acting assistant director of neurosurgery and director of pediatric neurosurgery at Boston City Hospital. After five years of academic neurosurgery with Harvard Hospitals, Dr. Cantu entered private neurosurgery practice at the suburban Emerson Hospital in Concord, Massachusetts where he currently serves as Chairman Department of Surgery, Chief Neurosurgical Service and Director Service of Sports Medicine.

In addition to his professional responsibilities, Dr. Cantu is medical director of the [National Center for Catastrophic Sports Injury Research, located in Chapel Hill, North Carolina](#), an ongoing registry instituted in 1982 for data collection and analysis of spine and head injuries. From this data important contributions have been made in sport safety and accident reduction; most notably football rule changes concerning tackling and blocking with the head, the establishment of football helmet standards, improved on-the-field medical care, and coaching techniques. He also serves on the Board of Trustees as Vice President and chairman of scientific committee of [NOCSAE](#) (National Operating Committee on Standards for Athletic Equipment).

Dr. Cantu also is Co-Director of the Neurological Sports Injury Center at Brigham and Women's Hospital in Boston, MA.

For many years, Dr. Cantu has been actively involved with the American College of Sports Medicine (ACSM), the oldest and largest sports medicine and exercise science organization in the world, and served as President of this organization from 1992 to 1993 and served as treasurer from 1996 to 1999. Dr. Cantu has received recognition from the college being named as the recipient of their Citation Award in 1996. This year Dr. Cantu gave the organizations most prestigious J.B. Dill Lecture on the History of Concussions at ACSMs annual meeting in New Orleans.

As spokesperson for ACSM, he has participated in nationally televised sports programs speaking on diverse sports issues and has appeared on "Larry King Live" discussing the Chris Benoit case in conjunction with Chris' father Michael Benoit, "ESPN Outside the Lines" discussing the Chris Benoit case, Canadian Television also discussing the Chris Benoit case as well as other media avenues, "NFL Today" with Bryant Gumbel and Terry Bradshaw, discussing the effect of artificial turf on cervical spine injuries, and football injuries on CNBC's "The Real Story". He has been interviewed for World News Tonight with Peter Jennings, CBS Evening News with Katie Couric, Dan Rather, and NBC Evening News with Brian Williams regarding gender and concussion incidence. He has been a spokesperson for ACSM on NASCAR deaths and safety issues surrounding NASCAR and has been interviewed for "World News Tonight" with Peter Jennings regarding NASCAR deaths and specifically Dale Earnhardt's death as well as safety issues in auto racing. Dr. Cantu also appeared on "ABC World News Tonight" with Bob Jamison regarding the Korey Stringer death from heat stroke as well as WGBH Channel 2 in Boston, NPR radio interview, WEEI Boston radio interview and ESPN's "Outside the Lines", all discussing the issue of heat stroke. He has discussed the health issues of football players with Mary Carillo on HBOs Inside the NFL and has done an interview regarding sports related injuries in cheerleading on Inside the NFL. Dr. Cantu has also been interviewed by Bob Costas on HBOs Inside the NFL regarding Concussion in Professional Sports and was the key speaker on Designer Steroids for Comcast Cable Network. Dr. Cantu is currently serving as the Consultant for NOCSAE to the NFL Concussion

Committee and Co-Chairman for the NASCAR Safety Task Force with ACSM. Dr. Cantu has done safety presentations for drivers and teams of CART as well as NASCAR. Dr. Cantu has been interviewed by ESPN Outside the Lines Tom Friend regarding Baby Joe Mesi and his return to boxing after a controversial subdural hematoma. Dr. Cantu continues to be an outspoken advocate for the sport of boxing and continues to advocate for the safety of that sport and its participants. Recently Dr. Cantu has done several interviews on Concussion in the NFL with ESPN, HBO and the Boston area news channels. Dr. Cantu has recently been involved with the NFL meeting in NYC regarding concussions and guidelines for concussions with Roger Goodell. Most recently Dr. Cantu has appeared on Brian Williams Rock Center with Kate Snow discussing concussion issues.

As an author of numerous books as well as articles on sports medicine topics, he is frequently invited to participate in symposiums addressing a wide range of sports medicine topics including anabolic steroid use; eating disorders in female athletes; acute and chronic brain injury in boxing; and on-the-field evaluation and medical management and return to play guidelines following head and spine sports injuries. *Dr. Cantu's most recent book "Concussion and Our Kids" was released September 19, 2012 from Houghton Mifflin Harcourt.*

He has served as a consultant to many scholastic and professional athletes on the return to collision sports after a head injury or spine injury, and is active speaking on a variety of health-related interests including the overall benefits of moderate regular exercise; the special health and exercise concerns of senior citizens; and sports safety issues with high school athletic trainers, coaches, students and parents. He currently serves as the Neurosurgical consultant to the Boston College Eagles Football team and served as the Neurosurgical consultant to the Boston Cannons professional Lacrosse team from 2003 to 2010. He recently was asked by the NFL Commissioner Roger Goodell to give two presentations at the NFL's concussion meeting in Chicago.

Practicing what he preaches, Dr. Cantu has enjoyed long-distance running since 1967. An official entrant in many Boston Marathons, he has also enjoyed the "long runs" at Newport and New York City,. Besides running, Dr. Cantu is a serious tennis player, for many years ranked in the men's senior singles in New England (NELTA) region. Dr. Cantu has two children, Rob and Elizabeth and a grandchild Jeremy and lives with his wife Tina in Lincoln, Massachusetts.

**PUBLICATIONS: 379**

<b>BOOK CHAPTERS</b>	<b>88</b>
<b>REFEREED ARTICLES</b>	<b>166</b>
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## ABSTRACTS AND FREE COMMUNICATIONS

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18. Cantu RC: Acute and chronic brain injury and contact sports. 1987; ACSM Clinical Conference, Keystone, CO.
19. Cantu RC: Concussion - what is it? Guidelines for returning to sports. 1987; ACSM Clinical Conference, Keystone, CO.

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21. Cantu RC: Medical aspects of boxing. 1987; ACSM Clinical Conference, Keystone, Co.
22. Cantu RC: Catastrophic Football Spine Injuries: 1977-1988. Joint Section on Disorders of the Spine and Peripheral Nerves 1990; AANS/CNS Annual Meeting, Captiva Island, FL.
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Cantu RC: "Indications for Surgery and Return to Competition After Lumbar Spine Injury"  
  
Cantu RC: "Legal Aspects of Sports Medicine and Role of the Team Physician"  
  
Cantu RC: "Epidemiology, Recognition, and Acute Management of Closed Head Injury/Concussion"  
  
Cantu RC: "Return to Competition After Head Injury"  
  
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1. Terell, T et al
2. Picano J, Cantu RC et al. Defining Concussion: An Empirical Analysis of Concussion Reporting Using a Specific Definition of Concussion. *Clin J Sports Med* (submitted)
3. Cantu RV, Cantu RC. Cervical Spine chapter for Lyle Micheli due October

## RECENT LECTURE PRESENTATIONS

- 1.17.14 NOCSAE Winter Board Meeting 2014  
Royal Palms  
Phoenix, AZ
- 12.14.13 Beth Israel Deaconess Hospital  
“Risks for and Management of Patients with Concussions”  
Dedham Holiday Inn  
Dedham, MA
- 10.25.13 Boston Sports Medicine Symposium 2013  
“How to Reduce the Risk of Concussions and CTE in Collision Sports”  
Waltham Woods conference Center  
Waltham, MA
- 10.24.13 ARP Annual conference  
VDARA Hotel & Spa  
Las Vegas, NV
- 10.16.13 Annual Emerson Hospital Auxiliary  
Nashawtuc Country Club  
Concord, MA
- 10.4.13 Reading Hospital  
Grand Rounds  
Thun/Janseen Auditorium  
West Reading, PA
- 9.12.13 Fourth Annual Sports Law & Ethics Symposium  
Santa Clara, CA
- 8.18.13 LA84 Foundation  
“The Concussion Crisis in Youth Sports”  
Los Angeles, CA
- 8.10.13 Massachusetts Coaches’ Association  
Worcester, MA
- 7.13.13 AOSSM 2013 Annual Meeting  
Sheraton Chicago Hotel & Towers  
Chicago, IL
- 6.28.13 NOCSAE Summer Board Meeting  
Fairmont Olympic Hotel  
Seattle, WA
- 5.17.13 10<sup>th</sup> Annual Sports-Related Conference on Concussion and Spine Injury  
“Cervicogenic Headache, Upper Cervical Spine”  
Martin conference Center at Harvard Medical School  
Boston, MA
- 4.24.13 Mackey-White TBI Committee Meeting  
Westin Grand Central  
New York, NY

4.11.13	New England Patriots Alumni Club, Inc. CBS Scene, Patriots Place Foxboro, MA
4.10.13	SLI Reception Boston Harbor Hotel Boston, MA
4.8.13	NOCSAE SAC Meeting Westin Atlanta Airport Hotel Atlanta, GA
3.22.13	8 <sup>th</sup> Annual Brain Injury Rehabilitation Conference “The Concussion Crisis-Later Life Consequences” “Why We Need to Re-Think How Youth Sports Are Played” Sheraton Carlsbad Resort Carlsbad, CA
3.9.13	Second Matthew Gfeller Neurotrauma Symposium “Are Professional Sports Athletes Different From the Rest? Chapel Hill, NC
1.27.13	NOCSAE Board Meeting Fairmont Olympic Hotel Seattle, WA
1.25.13	NOCSAE Board Meeting Phoenix, AZ
12.1.12	APR Winter Board Meeting Atlantic City, NJ
11.16.12	NOCSAE Grant Meeting Chapel Hill, NC
11.14.12	“Concussion and Our Kids” Park School of Baltimore Baltimore, MD
11.4.12	4 <sup>th</sup> International Consensus Conference on Concussion in Sport Writing Group FIFA House Zurich Switzerland
10.31.12 - 11.4.12	4 <sup>th</sup> International Consensus Conference on Concussion in Sport FIFA House Zurich Switzerland
10.27.12	Boston Sports Symposium “Protecting the Athlete’s Brain” Waltham Woods Conference Center Waltham, MA
10.26.12	2012 Brain Trauma and the Athlete Conference “Case Presentations and Discussion of Concussion, Post-Concussion Syndrome

And CTE”  
The Conference Center at Bentley College  
Waltham, MA

- 10.26.12        2012 Brain Trauma and the Athlete Conference  
“Graduated Return to Play and Academics”  
The Conference Center at Bentley College  
Waltham, MA
- 10.26.12        2012 Brain Trauma and the Athlete Conference  
“Pathophysiology and Biomechanics of Concussion, Head Injury, and  
Second Impact Syndrome”  
The Conference Center at Bentley College  
Waltham, MA
- 10.25.12        Hit Count Conference  
Waltham, MA
- 10.13.12        Eighteenth Annual Brain Injury Symposium  
Keynote Speaker  
“Short and Long-term Consequences of Repetitive Head Trauma, Post Concussion  
Syndrome – CTE Chronic Traumatic Encephalopathy”  
JW Marriott Hotel  
Miami, FL
- 10.12.12        2<sup>nd</sup> Annual Conference Concussion in Athletics: From Brain to Behavior”  
“Consequences of “Ignorance & Arrogance” in accurate assessment of sport-related  
Concussions”  
Penn State University, PA
- 9.30.12        Cleveland Clinic Lou Ruvo Center for Brain Health  
“Chronic Traumatic Encephalopathy (CTE) Conference 2012”  
“CTE in the NFL: What Changes Have Been Made and What More Needs to be Done?”  
Frank Gehry – designed Keep Memory Alive Center  
Las Vegas, NV
- 8.15.12        St. Mary’s Healthcare  
Gloversville High School  
ACT Presentation  
Gloversville, NY
- 8.15.12        St. Mary’s Healthcare  
Amsterdam High School  
ACT Presentation  
Amsterdam, NY
- 7.19.12        Center for the Study of Traumatic Encephalopathy  
Presentation to President BU
- 6.14.12        NOCSAE Board Meeting  
Intercontinental Hotel  
Kansas City, MO
- 6.1.12         ARP Annual Meeting

“Concussion and Head Trauma in Martial Arts”  
San Francisco Marriott Marquis  
San Francisco, CA

- 5.26.12      Congress AQMS 2012  
“Concussion Update 2012”  
Grenville-sur-la-Rouge  
Montreal Canada
- 5.18.12      Children’ Hospital Annual Sports Medicine Meeting  
Sports-Related Conference on Concussion and Spine Injury  
“Prevention of Concussion: What Works, What Doesn’t”  
Joseph B. Martin Conference Center  
Boston, MA
- 5.11.12      Injuries in Football 2012  
“Head and Spine Injuries in Football: Concussion: Where are We Now”  
Andrews Institute  
Destin, FL
- 4.24.12      FC Stars of MA  
“Concussion Prevention”  
Nashawtuc Country Club  
Concord, MA
- 4.23.12      National School Board Association Meeting  
“Head Injuries”  
Boston Convention Center  
Boston, MA
- 4.18.12      NOCSAE Retreat  
Westin Atlanta Airport  
Atlanta, GA
- 4.13.12      Emerson Hospital Grand Rounds  
“Current Concepts and Future Trends in Concussion Evaluation, Management and Treatment”  
Assembly Room A/B  
Emerson Hospital  
Concord, MA
- 4.11.12      FC Stars of MA  
“Concussion Prevention”  
Nashawtuc Country Club  
Concord, MA
- 3.26.12      NFLPA Annual Meeting  
Mackey-White Traumatic Brain Injury Committee  
Marco Island Marriott  
Marco Island, FL
- 3.23.12      2012 Harvard Law Sports Symposium  
“Concussion Crisis in Professional Sports”  
Panelist  
Harvard Law School  
Cambridge, MA

- 3.23.12 Parker Memorial DBP CME Program BU/BMC  
“Youth Concussions: Diagnosis, Management Including Return to Play and Prevention”  
Boston University School of Medicine  
Boston, MA
- 3.21.12 FC Stars of MA  
“Concussion Prevention”  
Nashawtuc Country Club  
Concord, MA
- 3.18.12 NHL Meeting  
New York, NY
- 3.11.12 APR Meeting  
JW Marriott  
Indianapolis, IN
- 2.25.12 Professional Football Chiropractic Meeting  
“Concussion Management: Short and Long-term Consequences of Mismanaging a Concussion”  
Indianapolis, IN
- 2.25.12 Professional Football Chiropractic Meeting  
“Catastrophic and Long-Term Outcomes After Traumatic Brain Injury”  
Indianapolis, IN
- 1.28.12 LifeBridge Health Concussion Symposium  
“Chronic Effects of Concussive Injury”  
Sinai Hospital of Baltimore Zamoiski Auditorium  
Baltimore, MD
- 1.25.12 Syracuse Neuroscience Grand Rounds  
“Short and Long Term Consequences of Mismanaging a Concussion”  
Upstate Medical University  
Syracuse, NY
- 1.21.12 NOCSAE Board Meeting  
SAC Report to Board of Trustees  
Royal Palms  
Phoenix, AZ
- 1.7.12 Eastern Athletic Trainers Association  
“Concussion Update”  
Copley Plaza  
Boston, MA
- 12.10.11 Beth Israel Deaconess Hospital Core Curriculum Series  
“Traumatic Brain Injury: From Concussions to More Severe Injuries”  
Dedham Holiday Inn  
Dedham, MA
- 12.9.11 Retired Men’s Association  
“Concussion Update”  
First Baptist Church  
Sudbury, MA
- 12.5.11 Congressional Hearings Testimony

NOCSAE  
Congress  
Washington, DC

- 11.17.11 Hyannis Rotary Club Luncheon  
“Concussion Crisis”  
Hyannis Country Club  
Hyannis, MA
- 11.14.11 NOCSAE Youth Football Helmet Meeting  
Westin Atlanta Airport  
Atlanta, GA
- 11.4.11 Boston Shoulder and Sports Symposium 2011  
“Concussion Update”  
Conference Center at Waltham Woods  
Waltham, MA
- 10.28.11 2011 Brain Trauma and Athletic Conference  
Boston University Center for the Study of Traumatic Encephalopathy  
“Return to Play Guidelines and Step-by-step Clinical Recommendations”  
Framingham Sheraton  
Framingham, MA
- 10.27.11 APR Annual Meeting  
“Chronic Traumatic Encephalopathy”  
Omni Orlando Resorts Championship Gate  
Orlando, FL
- 10.24.11 Harvard University Lunch Time Learning Talk  
“The neurophysiological cascade of concussion and brain damage – what is going on in the gray/white matter? Brain stem trauma – shearing/tearing – CNS damage from whiplash direct blows  
Murr Center, Harvard University  
Boston, MA
- 9.26.11 2011 Boston Public Schools Advanced Concussion Training  
“Concussion Management for Coaches”  
Northeastern University  
Boston, MA
- 9.22.11 Athletics Committee Williams College  
“New Trends in Concussion Management”  
Williams College  
Williamstown, MA
- 9.22.11 Athletics Committee Williams College  
“Concussion for Coaches and Trainers”  
Williams College  
Williamstown, MA
- 9.21.11 Grand Rounds Haywood Hospital  
“Current Evaluation and Management of Concussion”  
Henry Haywood Hospital

Gardner, MA

- 7.23.11      1<sup>st</sup> Annual USOC Sports Medicine Symposium  
“Keynote Presentation: Current Concepts and Future Trends in Concussion Evaluation,  
Management, and Treatment  
Olympic Training Center  
Colorado Springs, CO
- 7.17.11      ATSNJ 2<sup>nd</sup> Annual Sports Concussion Summit  
“Keynote Presentation: Long-Term Effects of Concussion  
Wyndham Princeton Forrestal Village  
Plainsboro, NJ
- 6.17.11      NOCSAE Board Meeting  
“Report of the Scientific Advisory Committee Meeting of 4.22.11  
Carolina Inn  
UNC Chapel Hill
- 6.4.11      2011 Jacksonville Concussion Summit  
“Concussion Management in your Community”  
Brooks Rehabilitation Hospital  
Jacksonville, FL
- 6.4.11      2011 Jacksonville Concussion Summit  
“Concussion 101”  
Brooks Rehabilitation Hospital  
Jacksonville, FL
- 5.28.11      Canadian Athletic Trainers Association Annual Meeting  
“Chronic Traumatic Encephalopathy”  
Banff, Alberta Canada
- 5.27.11      Sports-Related Conference on Concussion & Spine Injury  
“How the NFL Has Become a Leading Concussion Advocate”  
Fenway Park  
Boston, MA
- 5.7.11      Sports Related Concussion and Cervical Spine Injury Symposium  
“Everything You Wanted to Know About Sports Related Concussion:  
Epidemiology/Incidence/Research”  
Rust Auditorium – North Shore University Hospital  
Manhasset, NY
- 5.6.11      Andrews Institute “Injuries in Football” Conference  
“Concussion: More Than Just a Headache”  
Destin, FL
- 4.30.11      Inaugural UNC Matthew Gfeller Center Sport-Related Neurotrauma Symposium  
“Catastrophic and Long-Term Outcomes of TBI”  
UNC Chapel Hill
- 4.30.11      Inaugural UNC Matthew Gfeller Center Sport-Related Neurotrauma Symposium  
“Pharmacological Interventions and Return-To-Play After Spinal Injury”  
UNC Chapel Hill

- 4.29.11 Head Injury Symposium: Stunts & Tumbling, Cheerleading and other female sports  
“Keynote Message, The Latest on the Concussion Crisis”  
Omni Parker House Hotel  
Boston, MA
- 4.22.11 NOCSAE Scientific Advisory Committee Meeting  
Westin Atlanta  
Atlanta, GA
- 4.1.11 MMS and DPS Sports Concussion Symposium and State Laws  
“Concussion Management and Prevention”  
Mass Medical Society Conference Room  
Waltham, MA
- 3.23.11 RI Primary Care Physicians Corporation  
“Concussion Management – New Strategies”  
Crowne Plaza  
Warwick, RI
- 3.19.11 Massachusetts Neurology Society  
“Traumatic Brain Injury – Pathophysiologic Mechanisms”  
Newton Marriott  
Newton, MA
- 2.26.11 Joint Commission on Sports Medicine and Science  
“Boxing Policy/Legislation: How it Can Be Improved”  
Philadelphia Convention Center  
Philadelphia, PA
- 2.26.11 Joint Commission on Sports Medicine and Science  
“Concussion Landscape”  
Philadelphia Convention Center  
Philadelphia, PA
- 2.25.11 NFL Players Association Mackie/White TBI Committee  
“Concussion and the Role of the Helmet”  
Conrad Hotel  
Indianapolis, Indiana
- 02.02.11 39<sup>th</sup> Annual INS Meeting  
“Chronic Traumatic Encephalopathy: Long-term Consequences of Repetitive Brain Trauma”  
Boston, MA
- 1.14.11 Washington DC Children’s Hospital  
National Forum on Youth Sport Concussion Taking Action State by State  
“The Concussion Landscape”  
Children’s National Medical Center  
Washington, DC
- 1.11.11 Brigham Young University College of Life Sciences  
Sports Concussion and Brain Injury Seminar  
“Brain Injuries and Concussions”  
Brigham Young University, Provo, UT
- 12.13.10 NFL Players Association Meeting

Mackey-White TBI Committee Members  
Washington, DC

- 12.8.10 NFL Meeting  
“NOCSAE: Current and future helmet standards  
NYC, NY
- 11.18.10 Retired Athletes Meeting  
Chapel Hill, NC
- 11.10.10 Get aHead Workshop: Emerging Knowledge and Significance of Sports-Related Concussions  
“International Perspective On Concussions”  
Dartmouth-Hitchcock Medical Center  
Hanover, NH
- 11.04.10 AAPRP Annual Meeting The Brain and Neck In Boxing and Related Sports  
“Concussion Definitions and Clinical Manifestations  
Omni Orlando Resort at ChampionsGate  
Orlando, FL
- 11.01.10 Hockey Concussion in Canada  
Hockey Concussion Education Project (HCEP) – an Independent Physicians’ Study –  
Presentation of findings – Press Conference  
InterContinental Toronto Centre – Ontario Room  
Toronto, Canada
- 10.29.10 Boston Shoulder and Sports Symposium 15<sup>th</sup> Annual  
“Update Athletic Head and Neck Injuries”  
Mass Medical Society Conference Center  
Waltham, MA
- 10.20.10 Ice Hockey Summit: Action on Concussions  
“Incorporating Hockey and Medical Knowledge with Action Items for Prevention”  
Mayo Clinic  
Rochester, MN
- 10.13.10 Lincoln Sudbury Regional High School Sports Conference  
“Concussion in Sports Update”  
LSRHS Auditorium  
Sudbury, MA
- 10.5.10 “Gender and Age Effects On Concussion”  
22<sup>nd</sup> Annual Ironman Sports Medicine Conference in Conjunction with the 2010  
Ford Ironman World Championships  
Royal Kona Resort  
Kailua-Kona, HI
- 10.5.10 “Overview of Sports Related Concussion”  
22<sup>nd</sup> Annual Ironman Sports Medicine Conference in Conjunction with the 2010  
Ford Ironman World Championships  
Royal Kona Resort  
Kailua-Kona, HI
- 10.1.10 BU Second Annual Head Trauma in the Athlete Conference

Massachusetts Medical Society Auditorium  
Waltham, MA

- 9.23.10 Emerson Hospital Youth Sports Injury Symposium  
Concussions in Sports  
Concord Carlisle High School Auditorium  
Concord, MA
- 9.22.10 New Hampshire Pediatric Society  
“Concussion Recognition, Management and Long term Sequellae”  
SERESC Conference Center  
Bedford, NH
- 9.15.10 Brigham and Women’s Hospital CORE Meeting  
“Head Injuries and Athletes and Return to Play”  
Brigham and Women’s offsite at Chestnut Hill  
Chestnut Hill, MA
- 8.21.10 Athletic Trainers Association of New Jersey Concussion Summit  
“Management of Concussion 2010”  
Philadelphia, PA
- 6.28.10 “Coaches and Concussion”  
Hooksett, NH
- 6.17.10 “Physical Fitness and Sports Medicine – Post Concussion”  
“Short and Long Term Consequences of Mismanaging Concussion”  
8<sup>th</sup> Annual Symposium on Men’s Health  
Mass Medical Society Headquarters  
Waltham, MA
- 6.12.10 United States Sports Academy  
2009 United States Sports Academy Ernst Jokl Sports Medicine Award Presentation  
To Dr. Robert Cantu  
Harvard University  
Cambridge, MA
- 5.18.10 Association of Chief Executives of Sport  
“Short and Long Term Consequences of Mismanaging Concussion”  
Antlers Hilton Hotel  
Colorado Springs, CO
- 5.14.10 “What is a Concussion? Current Consensus Guidelines”  
The Seventh Annual Sports-Related Conference on Concussion & Spine Injury  
Presented by Brigham and Women’s Hospital  
Fenway Park  
Boston, MA
- 5.7.10 Keynote Speaker  
“Chronic Traumatic Encephalopathy”  
Neurology in the News  
The University of Toledo, Department of Neurology and Center for Continuing Medical Education  
Eleanor N. Dana Conference Center – University of Toledo

Toledo, Ohio

- 4.29.10     “Concussion in Sports Presentation at the CDC”  
National Center for Injury Prevention and Control  
Centers for Disease Control and Prevention  
Atlanta, GA
- 4.26.10     “2010 Sports and Society Colloquium”  
Brown University, Salomon Hall  
Providence, RI
- 4.22.10     “Short and Long Term Consequences of Mismanaging an Athletic Concussion”  
2010 Injuries in Football Course  
Andrews Institute  
Pensacola, FL
- 4.8.10         “Short and Long Term Consequences of Mismanaging Concussion”  
Massachusetts General Hospital Neurosurgery Grand Rounds  
Ether Dome, MGH  
Boston, MA
- 4.7.10         “Short and Long Term Consequences of Mismanaging a Concussion”  
Boston University Grand Rounds  
Boston University School of Medicine Continuing Medical Education  
Boston, MA
- 3.12.10         “The Triad of Symptomatic Concussion, Second Impact Syndrome and Thin Subdural Hematoma”  
Is Football Bad for the Brain?  
Forensic Scientific, Medical-Legal and Societal Aspects of Concussion Debate  
The Cyril H. Wecht Institute of Forensic Science and Law
- 3.12.10         “Update on NFL Concussion Committee Experiences”  
Is Football Bad for the Brain?  
Forensic Scientific, Medical-Legal and Societal Aspects of Concussion Debate  
The Cyril H. Wecht Institute of Forensic Science and Law
- 3.7.10         “Interactive Case Studies”  
Youth Sports Concussions: Education to Legislation  
Kane Hall Rm 130  
University of Washington Campus  
Seattle, Washington
- 3.6.10         Keynote Speaker  
“Chronic Traumatic Encephalopathy”  
Youth Sports Concussions: Education to Legislation  
Kane Hall Rm 130  
University of Washington Campus  
Seattle, Washington
- 2.18.10         “The Short and Long Term Consequences of Mismanaging Concussion”  
Concussion and Mild Traumatic Brain Injury: Update 2010  
CSM Annual Meeting

Omni San Diego Hotel  
San Diego, CA

- 1.26.10 NFL Players Association Concussion Committee  
Medical Committee  
Breakers  
Palm Beach, FL
- 1.9.10 "Concussions"  
Eastern Athletic Trainers Association Annual Meeting  
Marriott Copley  
Boston, MA
- 11.10.09 "Managing Concussion"  
Pediatric Brain Injury Conference – BIA-MA  
Best Western Royal Plaza  
Marlborough, MA
- 11.6.09 "Panel Discussion on TBI"  
Partnership for Military Medicine Symposium  
Omni Shoreham Hotel  
Washington, DC
- 10.30.09 "Concussions"  
Fourteenth Annual Boston Shoulder and Sports Symposium 2009  
Conference Center  
Waltham Woods, Waltham, MA
- 10.29.09 CNN - Lou Dobbs  
"Testimony before U.S. House Judiciary Committee"  
Time Warner Building – CNN Headquarters, NYC  
New York, NY
- 10.29.09 "Testimony Before U.S. House Judiciary Committee – Hearing on Legal Issues Relating To Football Head Injuries"  
Rayburn Building  
Washington, DC
- 10.16.09 "Study of Traumatic Encephalopathy"  
The American Association of Professional Ringside Physicians, Inc.  
2009 Annual Medical Seminar  
Mohegan Sun  
Uncasville, CT
- 10.2.09 Welcoming Remarks  
"Overview of Current Concussion Consensus Statements Including Zurich Conference"  
Concussion and the Athlete  
Boston University Medical Center School of Medicine Continuing Education  
Gillette Stadium, Foxboro, MA
- 10.2.09 "Panel Discussion"  
Concussion and the Athlete  
Boston University Medical Center School of Medicine Continuing Education

Gillette Stadium, Foxboro, MA

- 10.2.09     “Chronic Traumatic Encephalopathy and the Athlete – Update from the Center for the Study  
              Of Traumatic Encephalopathy”  
              Concussion and the Athlete  
              Boston University Medical Center School of Medicine Continuing Education  
              Gillette Stadium, Foxboro, MA
- 9.3.09     “Traumatic Brain Injury in Sports: When Can the Athlete Return to Play?”  
              XIV World Congress of Neurological Surgery of the WFNS  
              Boston, MA
- 6.18.09     “The Concussion Dilemma: Are We Headed in the Right Direction”  
              60<sup>th</sup> NATA Annual Meeting and Clinical Symposia  
              Henry B. Gonzalez Convention Center  
              San Antonio, TX
- 5.27.09     “Managing Sports Related Concussion in the Youth and Adolescent Athlete”  
              American College of Sports Medicine Annual Meeting  
              Seattle, WA
- 5.20.09     “Overview of Sports Concussion Consensus Statements and Chronic Traumatic  
              Encephalopathy”  
              Brain Injury Association of New Hampshire 26<sup>th</sup> Annual Brain Injury and Stroke Conference  
              Radisson, Manchester, NH
- 5.15.09     “Playing with Post Concussion Symptoms: Alarming Rates and Prevalence”  
              3<sup>rd</sup> Annual National Summit on Concussion and Other Sports Medicine Injuries  
              Westin Hotel LAX  
              Los Angeles, CA
- 5.15.09     “What Should a Concussion Evaluation Consist Of”  
              3<sup>rd</sup> Annual National Summit on Concussion and Other Sports Medicine Injuries”  
              Concurrent Afternoon Session  
              Westin LAX  
              Los Angeles, CA
- 5.14.09     Keynote Address:  
              College Athletic Trainers’ Society  
              2009 Spring Symposium for Athletic Trainers and Team Physicians  
              The Orleans Hotel and Casino  
              Las Vegas, Nevada
- 5.9.09     “Concussion Management: Yesterday, Today and Tomorrow”  
              Sanford Sports Medicine Symposium  
              Sanford University South Dakota Medical Center  
              Sioux Falls, South Dakota
- 5.9.09     “Return to Play Issues Following Cervical Spine Injury”  
              Sanford Sports Medicine Symposium  
              Sanford University South Dakota Medical Center  
              Sioux Falls, South Dakota
- 5.9.09     “Catastrophic and Long Term Effects of Concussion”  
              Sanford Sports Medicine Symposium  
              Sanford University South Dakota Medical Center

Sioux Falls, South Dakota

- 5.9.09     “On-the-Field Management of the Concussed Athlete”  
Sanford Sports Medicine Symposium  
Sanford University South Dakota Medical Center  
Sioux Falls, South Dakota
- 5.1.09     “Overview: Current Concussion Guidelines from the International Study Group”  
6<sup>th</sup> Annual Sports Conference  
BWH Hospital Conference  
Fenway Park  
Boston, MA
- 4.27.09    “Coaches Education Initiative”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 4.27.09    “Celebrity Athletes – Is Management the Same?”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 4.27.09    “Legal Case Discussion Sport and the Law”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 4.21.09    “Traumatic Brain Injury & Physiological Disorders Facing Athletes Post Performance”  
Summit on Health of the Former Professional Athlete  
LaQuinta Spa and Resort  
Palm Springs, CA
- 4.13.09    “Pharmacological Interventions in Management of Spine Injuries”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 4.13.09    “Return to Play After Spinal Injury”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 4.13.09    “Spine Injuries and Contraindications to Participation in Collision Sports”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 4.5.09     “Current Concussion Classification and Return to Play Criteria”  
First Annual Spring Current Concepts in Sports Related Concussions Symposium  
Athletic Trainer Solutions  
St. Paul Catholic High School  
Bristol, CT

- 3.16.09      "Overview of Injury Types and Associated Complications"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 3.16.09      "Anatomy and Biomechanics of Spine Injuries in Sport"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 3.16.09      "Spine Injuries – Which Sports are at Greatest Risk and Why?"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 2.16.09      "Case Studies"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 2.16.09      "Parkinson's Disease"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 2.16.09      "Chronic Traumatic Encephalopathy"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 2.16.09      "Post Concussion Syndrome"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 1.27.09      Press Conference  
Chronic Traumatic Encephalopathy  
In Association with the Super Bowl  
Tampa, Florida
- 1.26.09      "Anatomical Dissection of the Brain"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 1.26.09      "Headaches in the Athlete"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 1.26.09      "Epilepsy and Athletics"  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC
- 1.26.09      "Stroke in Athletes"

Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC

- 1.26.09     “Malignant Brain Edema and Second Impact Syndrome”  
                Neurologic Head and Spine Injuries Semester Course Lecture  
                University of North Carolina – Doctorate Program Presentation  
                Chapel Hill, NC
- 1.26.09     “Intercerebral Hematoma”  
                Neurologic Head and Spine Injuries Semester Course Lecture  
                University of North Carolina – Doctorate Program Presentation  
                Chapel Hill, NC
- 1.17.09     “Current Testing and Return to Play Issues/Guidelines – Zurich Update”  
                London Hockey Concussion Summit  
                London Hilton Hotel  
                London, Ontario, Canada
- 1.12.09     “Ionic and Metabolic Consequences of Concussion”  
                Neurologic Head and Spine Injuries Semester Course Lecture  
                University of North Carolina – Doctorate Program Presentation  
                Chapel Hill, NC
- 1.12.09     “Athletic Head Injuries – Which Sports are at Greatest Risk and Why?”  
                Neurologic Head and Spine Injuries Semester Course Lecture  
                University of North Carolina – Doctorate Program Presentation  
                Chapel Hill, NC
- 1.9.09       “Post Concussion Syndrome and Traumatic Encephalopathy”  
                Emerson Hospital Medical Staff Clinical Conference  
                Emerson Hospital, Concord, MA
- 1.6.09       “Post Concussion Syndrome and Traumatic Encephalopathy”  
                Boston University Grand Rounds Presentation  
                Boston, MA
- 10.30-31.08    “Is Immediate Return to Play in the Same Game Ever Justified?”  
                3<sup>rd</sup> International Conference on Concussion in Sport  
                Hotel Zurichberg  
                Zurich Switzerland
- 10.18.08     “Pituitary Dysfunction in Professional Boxing and the National Football League”  
                2008 Annual Medical Seminar, AAPRP  
                Paris/Bally’s Resort & Casino  
                Las Vegas, Nevada
- 10.3.08      “Return to Boxing After Subdural Hematoma – When?”  
                World Boxing Association Medical Seminar, 87<sup>th</sup> Annual Convention  
                Hotel Barcelo Bavaro Palace  
                Punta Cana, Dominican Republic
- 9.18.08      “Traumatic Brain Injury and Shaken Baby Syndrome”  
                14<sup>th</sup> International Conference Child Abuse Allegations: Separating Scientific Fact from Fiction

Riviera Hotel and Casino  
Last Vegas, NV

- 7.24.08      "Preventive Aspects of Sports Concussion"  
                  New Developments in Sports-Related Concussion Conference  
                  Sheraton Station Square  
                  Pittsburgh, PA
- 6.21.08      "Concussion in Sports"  
                  New York State Public High School Athletic Association (NYSPHSAA)  
                  Saratoga, NY
- 6.11.08      "Neurotrauma in Sports"  
                  Symposium on the Prevention of Spinal Cord Injuries and Concussions in Hockey  
                  Hockey Hall of Fame  
                  Toronto, Canada
- 5.28.08      "Neuropsychological Assessment of the Concussed Athlete: Only One Piece of the Concussion  
                  Puzzle"  
                  ACSM 55<sup>th</sup> Annual Meeting  
                  Indianapolis, IN
- 5.9.08        "Concussion in Women Athletes"  
                  2008 Sports Related Conference on Concussion and Spine Injury  
                  Brigham and Women's Hospital  
                  Fenway Park  
                  Boston, MA
- 5.3.08        "Concussion in Sports"  
                  The Hill School  
                  Pottstown, PA
- 5.1.08        "Concussion and High School Sports, Risks and Management"  
                  Arlington High School  
                  Arlington, MA
- 4.19.08      "Concussion in Sports: Does Gender Matter?"  
                  The National Concussion Summit  
                  Concussion in Sports: Advancing Health and Safety  
                  Marriott Hotel  
                  Marina del Rey, CA
- 4.18.08      "Concussion in Sports: Does Gender Matter?"  
                  The National Concussion Summit  
                  Concussion in Sports: Advancing Health and Safety  
                  Marriott Hotel  
                  Marina del Rey, CA
- 4.3.08        "Concussions and Sports"  
                  Winchester High School  
                  Winchester, MA
- 3.13.08      "Clinical Models for Concussion Management and Return to Play"

Fourth International Meeting on Minor Traumatic Brain Injury in Sports  
Hotel Crystal, St. Moritz, Switzerland

- 3.8.08           “Concussions and the Sports Legacy Institute”  
Joint Commission on Sports Medicine and Science 2008  
New Orleans Hilton Riverside  
New Orleans, LA
- 12.13.07       “Current Advances in Concussion Management/Traumatic Encephalopathy”  
Grand Rounds  
Brigham and Women’s Hospital  
Boston, MA
- 11.29.07       “Concussion in Sports”  
Two presentations to student assemblies  
Concord Carlisle High School  
Concord, MA
- 11.28.07       “Concussion and Sports”  
Presentation for parents, coaches, trainers, nurses and physicians  
Concord Carlisle High School  
Concord, MA
- 11.26.07       “Chronic Traumatic Encephalopathy/Concussion”  
Boston Medical Center Grand Rounds  
Boston Medical Center  
Boston, MA
- 11.29.07       “Update Baby Joe Mesi”  
Medical Advisory Board Meeting  
Massachusetts Boxing Commission  
McCarthy Building  
Boston, MA
- 11.29.07       “More Than Just a Bump on the Head”  
Concord Carlisle High School Students Presentation  
Two Presentations One hour each to student body  
Concord, MA
- 11.28.07       “More Than Just a Bump on the Head”  
Concord Carlisle High School Parents Presentation  
Concord, MA
- 11.26.07       “Concussion and Sports Related Head Injury”  
Neurosurgery/Surgery Grand Rounds  
Boston University Medical Center  
Boston , MA
- 11.15.07       “Joe Mesi Update”  
AAPRP Annual Meeting  
Intercontinental Hotel and Resort  
San Juan, Puerto Rico
- 10/29/07       “Concussion in High School”

Woburn High School  
Woburn, MA

- 10/26/07      "Concussion and Sudden Death: Coping With Two Crises"  
Independent School Health Association Annual Meeting  
New Canaan Country School  
New Canaan, CT
- 9/27/07      "Concussions in High School"  
Austin Prep School  
Reading, MA
- 9/24/07      "The Concussion Crisis in Football"  
U Mass Lowell Athletic Department Meeting  
McGauvran Hall  
Lowell, MA
- 9/17/07      "History of Concussion and Second Impact Syndrome"  
New Hampshire Interscholastic Athletic Association  
Annual Meting  
Courtyard by Marriott  
Concord, NH
- 7/13/07      "Concussion/Brain"  
The American Orthopedic Society for Sports Medicine Annual Meeting  
TELUS Convention Center  
Calgary, Canada
- 7/12/07      "Spine Instructional Course"  
The American Orthopedic Society for Sports Medicine Annual Meeting  
TELUS Convention Center  
Calgary, Canada
- 6/1/07      The D.B. Historical Lecture  
"The Evolution of Sports-related Concussion Recognition, Management and Prevention: The Science, the Art and the Politics."  
Annual Meeting ACSM  
New Orleans, Louisiana
- 5.5.07      "Concussion: How to make the diagnosis and Overview of Current Concussion Consensus Statements"  
Sports Specific Rehabilitation Program  
High Performance Sports, Inc.  
Peabody, MA
- 4/30/07      "Concussion Management and Diagnosis"  
New England University Medical Department Seminar  
New England University  
Biddeford, ME
- 4/27/07      "Overview of Current Concussion Consensus Statement"  
2007 Sports Related Conference on Concussion and Spine Injury  
Fenway Park

Boston, MA

- 4.20.07      "Traumatic Encephalopathy Among NFL Players"  
The National Concussion Summit. Concussion in Sports: The Under-Recognized Public  
Epidemic  
The Marriott Hotel  
Los Angeles, CA
- 4/20/07      "Concussion in Sports: State of the Science - Discussant"  
The National Concussion Summit: Concussion in Sports: The Under-Recognized Public  
Epidemic  
The Marriott Hotel  
Los Angeles, CAS
- 4/18/07      "Argument to Ban Boxing – Analysis of Neurological Injury"  
75<sup>th</sup> Annual Meeting of the American Association of Neurological Surgeons  
Washington, DC
- 3/15/07      "Can the Recognition and Treatment of Hypopituitarism After mTBI Influence Post Concussion  
Syndrome"  
Third International Meeting on Minor Traumatic Brain Injuries in Sports  
St. Moritz, Switzerland
- 3/14/07      "How Many Concussion Are Too Many"  
Third International Meeting on Minor Traumatic Brain Injuries in Sports  
St. Moritz, Switzerland
- 12/8/06      "Cervical Spine Return to Play Issues"  
ACSM - Advanced Team Physician Course  
Omni Orlando Resort at Championsgate  
Orlando, FL
- 12/8/06      "MBTI Return to Play Issues"  
ACSM Advanced Team Physician Course  
Omni Orlando Resort at Championsgate  
Orlando, FL
- 11/9/06      "Concussion Management"  
Acute Management of Mild Traumatic Brain Injury in Military Operational Settings  
Department of Defense Meeting  
Washington, DC
- 10/24/06      "A Case of Concussion in Pop Warner Football"  
Playing It Safe  
Brain Injury Association of Massachusetts Sports Injury Conference  
Best Western Royal Plaza Hotel  
Marlborough, MA
- 9/15/06      "Intracranial Bleeding in Boxing/The Joe Mesi Story Round 3"  
American Association of Professional Ringside Physicians  
2006 Annual Medical Seminar  
Luxor Hotel and Casino  
Las Vegas, NV

9/9/06	“Neurosurgery Head and Neck Injury Update” Emerson Hospital Fall Sports Primer Harvey Wheeler Community Center Concord, MA
05/19/06	Case Presentations Sports Related Concussion and Spine Injury Conference 2006 Brigham and Women’s Neurological Injury Center Fenway Park Boston, MA
05/13/06	“Management of Cervical Injuries and Related Disorders” Sports Medicine and Football: The 20006 Perspective AOSSM Meeting Seminole Hard Rock Hotel and Casino Hollywood, FL
05/12/06	Physical Examination Spine Sports Medicine and Football: The 2006 Perspective AOSSM Meeting Seminole Hard Rock Hotel and Casino Hollywood, FL
03/10/06	“Return to Boxing After Intracranial Hemorrhage” USA Boxing Physician Symposium 2006 US Olympic Training Center Colorado Springs, CO
03/10/06	“Acute and Chronic Brain Injuries in Boxing” USA Boxing Physician Symposium 2006 US Olympic Training Center Colorado Springs, CO
03/07/06	“Acute TBI Assessment and Secondary Prevention” Armed Forces Epidemiological Board Meeting Armed Forces Medical Intelligence Center Fort Detrick Frederick, MD
02/24/06	“Evolution of the Understanding of Concussion” Concussion in Youth Sports Summit Brain Injury Association of New Jersey Stadium Club at Giants Stadium Rutherford, NJ
10/28/05	“PASSOR: Sub-Acute Assessment and Management: Grading Systems: Initial Symptom Management: Second Impact Syndrome: When to Order Imaging” American Academy of Physical Medicine and Rehabilitation 2005 Annual Assembly Philadelphia Marriott Downtown Philadelphia, PA
10/28/05	“PASSOR: Concussion/Mild Traumatic Brain Injury: Return to Play and Function Decision Making”

American Academy of Physical Medicine & Rehabilitation  
2005 Annual Assembly  
Philadelphia Marriott Downtown  
Philadelphia, PA

- 10/27/05 "PASSOR: Vienna Conference Update and Future Decisions: Meet the Experts"  
American Academy of Physical Medicine & Rehabilitation  
2005 Annual Assembly  
Philadelphia Marriott Downtown  
Philadelphia, PA
- 6/25/05 "Catastrophic Spine Injury in American Football – effect of athlete education and rule change"  
1<sup>st</sup> World Congress on Sports Injury Prevention  
Holmenkollen Park Hotel  
Oslo, Norway
- 5/20/05 "What's New in Concussion Research and Overview of Prague Concussion Consensus Statement  
Brigham and Women's 2<sup>nd</sup> Annual Sports Medicine Symposium  
Gillette Stadium  
Foxboro, MA
- 5/20/05 "NATA/AFCA Spearing in Football Task Force Recommendations"  
Brigham and Women's 2<sup>nd</sup> Annual Sports Medicine Symposium  
Gillette Stadium  
Foxboro, MA
- 5/13/05 "Concussion in Sports"  
Mass Academy of Family Physicians Annual Meeting  
Fort Point Sheraton  
Leominster, MA
- 4/30/05 "Interesting Sport Medicine Cases of Concussion in Athletes"  
Concussion in Sports Conference  
Penn State University  
The Penn Stater Conference Center Hotel  
University Park, PA
- 4/29/05 "Concussion Classification: Scales and Categories"  
Concussion in Sports Conference  
Penn State University  
The Penn Stater Conference Center Hotel  
University Park, PA
- 3/10/05 "Catastrophic Spinal Injuries in Football"  
5<sup>th</sup> Annual Sports Medicine and Neurotrauma Review  
Portofino Bay Hotel  
Orlando, FL
- 3/10/05 "Management of Difficult Spine Cases In Athletes"

5<sup>th</sup> Annual Sports Medicine and Neurotrauma Review  
Portofino Bay Hotel  
Orlando, FL

- 3/12/05      "When to Retire After a Concussion"  
5<sup>th</sup> Annual Sports Medicine and Neurotrauma Review  
Portofino Bay Hotel  
Orlando, FL
- 3/12/05      "Can Second Impact Syndrome Be Eliminated?"  
5<sup>th</sup> Annual Sports Medicine and Neurotrauma Review  
Portofino Bay Hotel  
Orlando, FL
- 3/12/05      "Recommendations from 2004 NATA Position Statement"  
5<sup>th</sup> Annual Sports Medicine and Neurotrauma Review  
Portofino Bay Hotel  
Orlando, FL
- 3/12/05      "2004 Prague International Concussion Conference Consensus Statement"  
5<sup>th</sup> Annual Sports Medicine and Neurotrauma Review  
Portofino Bay Hotel  
Orlando, FL
- 3/15/05      "Concussion, Head and Neck Injuries"  
Spring Sports Primer  
Emerson Hospital/Harvey Wheeler Community Center  
West Concord, MA
- 2/9/05      "Alanto-Occipital Dislocation – A Largely Preventable Previously Fatal Injury"  
Motorsports Safety Conference  
American College of Sports Medicine Team Physician Pre Conference Course  
Hyatt Regency on the Boardwalk  
San Antonio, TX
- 11/5/04      "National Football League (NFL) and NCAA Football Study"  
IIHF Meeting  
Second International Symposium on Concussion in Sport  
Prague, Czech Republic
- 11/6/04      "How can we prevent diffuse brain swelling/SIS in children?  
IIHF Meeting  
Second International Symposium on Concussion in Sport  
Prague, Czech Republic
- 11/6/04      "When Should an Athlete Retire Following Concussion"  
IIHF Meeting  
Second International Symposium on Concussion in Sport  
Prague, Czech Republic
- 9/23/04      "Primary Care Management of Closed Head Injuries"  
Southboro Medical Group Meeting

Southboro, MA

- 7/18/04      "Concussion Guidelines - Current Status"  
University of Pittsburgh Medical Center  
New Developments in Sports – Related Concussion  
The Westin Convention Center  
Pittsburgh, PA
- 6/24/04      NFL Meeting  
NFL Headquarters  
New York, NY
- 6/16/04      Press Conference  
"Position Statement on Sports – Related Concussion"  
National Athletic Trainers Association Annual Meeting  
Baltimore, MD
- 5/22/04      "Diffuse Brain Injuries"  
The William W. Backus Hospital Trauma Department  
Athletic Injuries of the Head and Neck  
Foxwood Resort Casino  
Uncasville, CT
- 5/4/04      "Fatal Brain Injuries in American Football (1945-1999)"  
Sports Concussion and Spine Injury Conference  
Brigham and Women's Hospital  
Fenway Park  
Boston, MA
- 5/1/04      "Challenges In Identifying and Treating Sports Injuries"  
2004 AANS Annual Meeting  
Orlando Convention Center  
Orlando, FL
- 4/6/04      "Concussions in the Active Child, Adolescent, and Young Adult: Current Concepts, New Findings and Re-Education"  
Massachusetts Medical Society Meeting  
Waltham, MA
- 9/11/03      "Head Injury and the Risk of Alzheimer's Disease and Depression"  
American Association of Ringside Physicians  
Aladdin Hotel  
Las Vegas, Nevada
- 7/4/03      "Effects of Dehydration on Race Car Drivers"  
Daytona Pepsi 400 Race  
Daytona International Speedway  
Daytona Beach, Florida
- 6/21/03      "Cervical Spinal Stenosis – A Contraindication for Collision Sports"  
International Academy for Sports Dentistry 2003 Annual Meeting

Caribe Hilton Hotel  
San Juan, Puerto Rico

- 6/20/03     “Cerebral Concussion Controversies in Sports”  
International Academy for Sports Dentistry 2003 Annual Meeting  
Caribe Hilton Hotel  
San Juan, Puerto Rico
- 5/30/03     “Emergency Care of the Spine Injured Athlete”  
American College of Sports Medicine Annual Meeting  
San Francisco Convention Center  
San Francisco, California
- 5/30/03     “On-the-Field Management of the Spine-Injured Athlete”  
American College of Sports Medicine Annual Meeting  
San Francisco Convention Center  
San Francisco, California
- 5/30/03     “Life After Football: History of Concussive Injuries, Onset of Neurologic Disorders, and Mental Health Issues in former NFL Players”  
American College of Sports Medicine Annual Meeting  
San Francisco Convention Center  
San Francisco, California
- 5/9/03       “Athletic Head and Spine Injuries and Return To Play Decisions”  
3<sup>rd</sup> Annual Legacy Neurosurgery Symposium  
Legacy Good Samaritan Hospital  
Portland, Oregon
- 4/29/03     “Challenges in Identifying and Testing Sport Injuries”  
American Association of Neurological Surgeons Annual Meeting  
San Diego, CA
- 3/8/03       “Acute Concussion Evaluation and Post Concussion Syndrome”  
Texas ACMS Annual Meeting  
Omni Houston Hotel Westside  
Houston, Texas
- 1/16/03     “ACSM Motorsports Taks Force Committee Report”  
International Council Motorsports Sciences  
Mirage Hotel  
Las Vegas, Nevada
- 2/7/03       “Brain Fatalities in American Football Over the Last 55 Years”  
3<sup>rd</sup> Annual Neurotrauma and Sports Medicine Review  
Grand Floridian Hotel  
Orlando, Florida
- 2/7/03       “Interesting Sports Medicine Cases: A Potpourri of Head and Spine Cases”  
3<sup>rd</sup> Annual Neurotrauma and Sports Medicine Review  
Grand Floridian Hotel  
Orlando, Florida

- 2/7/03           “Ongoing Concussion Controversy”  
3<sup>rd</sup> Annual Neurotrauma and Sports Medicine Review  
Grand Floridian Hotel  
Orlando, Florida
- 2/8/03           “On-going Cervical-Spinal Stenosis Controversy”  
3<sup>rd</sup> Annual Neurotrauma and Sports Medicine Review  
Grand Floridian Hotel  
Orlando, Florida
- 12/5/02          “Closed Head Injuries”  
Thirtieth Annual Meeting Cervical Spine Research Society  
Fontainbleu Hilton Hotel  
Miami Beach, Florida
- 12/5/02          “On-the-Field Evaluation of Head Injuries”  
Thirtieth Annual Meeting Cervical Spine Research Society  
Fontainbleu Hilton Hotel  
Miami Beach, Florida
- 9/26/02          “Concussion Guidelines and Return to Play Criteria”  
Greater New York State Orthopedic Association  
Saratoga, N.Y.
- 7/20/02          “Concussion in Sports Medicine”  
New Developments in Sports Related Concussion  
University of Pittsburgh School of Medicine  
Pittsburgh, PA
- 6/19/02          “Concussion in Sports Medicine”  
Sports Medicine Core Curriculum Series Harvard Medical School  
Massachusetts General Hospital  
Boston, MA
- 6/16/02          “Introduction to the Problem: The Grading Scale and RTP Dilemma”  
National Athletic Trainers Association: Annual Meeting  
Dallas, TX
- 6/5/02           “Concussion in Athletic Sports-Controversies Regarding Grading and Return to Play  
Guidelines”  
Connecticut Athletic Trainers Association Annual Meeting  
Trinity College  
Hartford, Connecticut
- 6/1/02           “On-the-Field Evaluation of Head and Neck Injured Athletes  
American College of Sports Medicine: Annual Meeting  
St. Louis, MO
- 5/31/02          “Prehospital Care of the Spine-Injured Athlete: A Critical Look at the Task Force Document”  
American College of Sports Medicine: Annual Meeting  
St. Louis, MO
- 5/31/02          “On-the-Field Evaluation of Head and Neck Injuries”

American College of Sports Medicine: Annual Meeting  
St. Louis, MO

- 5/30/02     “The Pros and Cons of Neuropsychological Testing in Concussion”  
“The Practical Use of Neuropsychological Testing: Clinically and in Research  
American College of Sports Medicine: Annual Meeting  
St. Louis, MO
- 4/13/02     “Grading Scale for Concussion in Sports”  
American Academy of Neurology  
Denver, Colorado
- 2/16/02     “Overview of Concussion”  
2<sup>nd</sup> Annual Neurotrauma and Sports Medicine Review  
Alleghany Hospital, Pittsburgh, PA  
Caribe Royale Resort Suites and Villas  
Orlando, Florida
- 2/16/02     “Head Injury in Recreational Sports”  
2<sup>nd</sup> Annual Neurotrauma and Sports Medicine Review  
Alleghany Hospital, Pittsburgh, PA  
Caribe Royale Resort Suites and Villas  
Orlando, Florida
- 2/16/02     “Guidelines for Return to Competition after a Mild Head Injury”  
2<sup>nd</sup> Annual Neurotrauma and Sports Medicine Review  
Alleghany Hospital, Pittsburgh, PA  
Caribe Royale Resort Suites and Villas  
Orlando, Florida
- 11/3/01     “Panel Discussion: When to retire from sports”  
European Sports Medicine Conference  
Vienna, Austria
- 11/3/01     “Assessing Concussions: Review of Grading Systems”  
European Sports Medicine Conference  
Vienna, Austria
- 10/1/01     “Neurosurgical Management of Athletic Injuries”  
Congress of Neurological Surgeons 51<sup>st</sup> Annual Meeting  
San Diego, California
- 10/1/01     “On-the-Field Management of Head and Neck Injuries”  
Kerlin Jobe Clinic  
Los Angeles, California
- 7/28/01     New Developments in Sports Related Concussion  
“Models of Concussion Management: Current Models of Concussion  
Management: Where Are We Headed?”  
University of Pittsburgh School of Medicine Center for Continuing  
Education in the Health Sciences, Department of Orthopedic Surgery,  
UPMC Health System Center for Sports Medicine, Western Psychiatric

Institute and Clinic  
Hilton Hotel, Pittsburgh, PA

- 6/8/01 "Second Impact Syndrome"  
Manitoba Public Insurance and the Workers Compensation Board of  
Manitoba Continuing Medical Education Guest Speakers Series  
Winnipeg, Canada
- 6/8/01 "Return to Play After Concussion"  
Manitoba Public Insurance and the Workers Compensation Board of  
Manitoba Continuing Medical Education Guest Speakers Series  
Winnipeg, Canada
- 6/8/01 "Concussion Grading Systems"  
Manitoba Public Insurance and the Workers Compensation Board of  
Manitoba Continuing Medical Education Guest Speakers Series  
Winnipeg, Canada
- 6/8/01 "Biomechanical and Pathophysiology of Head Injury"  
Manitoba Public Insurance and the Workers Compensation Board of  
Manitoba Continuing Medical Education Guest Speakers Series  
Winnipeg, Canada
- 6/8/01 "Overview of Concussion"  
Manitoba Public Insurance and the Workers Compensation Board of  
Manitoba Continuing Medical Education Guest Speakers Series  
Winnipeg, Canada
- 6/8/01 "Guidelines to the Evaluation of Mild Traumatic Brain Injury in Motor Vehicle Accidents and Work Injuries"  
Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing  
Medical Education Guest Speakers Series  
Winnipeg, Canada
- 5/31/01 "On-the-Field Evaluation of Head and Neck Injuries"  
American College of Sports Medicine Annual Meeting  
Baltimore Convention Center  
Baltimore, Maryland
- 5/31/01 "Return to Play Decisions Following Concussion: Controversies and Dilemmas"  
American College of Sports Medicine Annual Meeting  
Baltimore Convention Center  
Baltimore, Maryland
- 5/30/01 "NASCAR Deaths: Were they preventable"  
American College of Sports Medicine Annual Meeting  
Baltimore Convention Center  
Baltimore, Maryland
- 5/19/01 "Concussion: Its Effect Upon the Brain"  
Salem Sports Medicine Conference Head and Neck Injuries in Athletes

Colonial Sheraton  
Lynnfield, Massachusetts

- 5/7/01     “On-the-Field Evaluation of Athletic Head and Spine Injury”  
New York State Public High School Athletic Association  
Carrier Circle Holiday Inn  
Syracuse, New York
- 5/7/01     “Evaluation, Treatment and Return to Play Decisions Regarding Athletic Head and Spine Injury”  
New York State Public High School Athletic Association  
Carrier Circle Holiday Inn  
Syracuse, New York
- 5/5/01     “Athletic Cervical Spine Injuries”  
American Academy of Neurology 53<sup>rd</sup> Annual Meeting  
Pennsylvania Convention Center  
Philadelphia, PA
- 3/19/01     “NASCAR Deaths: Were they preventable”  
Neurotrauma and Sports Medicine for the New Millennium  
Department of Neurosurgery, Allegheny General Hospital  
The Shadow Ridge Hotel and Conference Center  
Park City, Utah
- 3/19/01     “Adult vs. Pediatric Athletic Spine Injuries: Management Issues”  
Neurotrauma and Sports Medicine for the New Millennium  
Department of Neurosurgery, Allegheny General Hospital  
The Shadow Ridge Hotel and Conference Center  
Park City, Utah
- 3/19/01     “Athletic Head and Spinal Cord Injuries”  
Neurotrauma and Sports Medicine for the New Millennium  
Department of Neurosurgery, Allegheny General Hospital  
The Shadow Ridge Hotel and Conference Center  
Park City, Utah
- 3/19/01     “On-the-Field Management of Athletic Head Injuries”  
Neurotrauma and Sports Medicine for the New Millennium  
Department of Neurosurgery, Allegheny General Hospital  
The Shadow Ridge Hotel and Conference Center  
Park City, Utah
- 3/19/01     “Overview of Concussion”  
Neurotrauma and Sports Medicine for the New Millennium  
Department of Neurosurgery, Allegheny General Hospital  
The Shadow Ridge Hotel and Conference Center  
Park City, Utah
- 12/2/00     “Second Impact Syndrome”  
Sports Neurology Injuries of the Head and Spine  
Hospital for Special Surgery, Burke Rehabilitation Hospital and the Weill Medical College of Cornell University

Uris Auditorium  
New York, New York

- 11/18/00      "Catastrophic Football Head Injuries"  
Southwest Chapter American College Sports Medicine 2000 Annual Meeting  
Bahia Hotel  
San Diego, CA
- 11/3/00      "Practical Management of Head Injuries and Concussion in Sport"  
British Association of Sports and Exercise Medicine  
Hilton Puckrup Hall  
Tewkesbury, Gloucestershire England
- 9/16/00      "Diagnosis and Nonsurgical Treatment and Rehabilitation of Degenerative Cervical Conditions"  
7<sup>th</sup> Annual Symposium New Hampshire Musculoskeletal Institute  
Saint Anselm College, Manchester, NH
- 06/04/99      "On-The-Field Evaluation of Head and Neck Injuries"  
American College of Sports Medicine: Annual Meeting  
Washington State Convention and Trade Center  
Seattle, Washington
- 06/03/99      "Concussion Symposium"  
American College of Sports Medicine: Annual Meeting  
Washington State Convention and Trade Center  
Seattle, Washington
- 05/28/99      "Concussion: Mechanisms and Classifications"  
Sports Related Concussions and Nervous System Injury Conference  
Orlando Regional Healthcare System  
Hotel Royal Plaza  
Orlando, Florida
- 12/10/98      "Headaches"  
Middlesex Community College Community Lecture  
Bedford, Massachusetts
- 11/08/98      "Sports Related Concussion Controversies: Neuropsychological Aspects and Return to Play Issues:  
Traumatic Brain Injury and Stroke Conference  
Healthsouth Braintree Rehabilitation Hospital  
Royal Sonesta Hotel  
Boston, Massachusetts
- 06/06/98      "Examination of the Spine"  
American College of Sports Medicine: Annual Meeting  
Orange County Convention Center  
Orlando, Florida
- 06/05/98      "Age, Ethical, Sociological, and Safety Issues in Boxing Especially as Regards Head Injury"  
American College of Sports Medicine: Annual Meeting

Orange County Convention Center  
Orlando, Florida

- 06/02/98        "Age in Boxing: Should there be an age limit"  
XXVI FIMS World Congress of Sports Medicine  
Orange County Convention Center  
Orlando, Florida
- 05/15/98        "Return to Sports Criteria Following Concussion"  
Innovative Symposiums/Sports Related Concussion  
Smithtown Sheraton  
Long Island, New York
- 05/15/98        "Concussion Classification and Implementation"  
Innovative Symposiums/Sports Related Concussion  
Smithtown Sheraton  
Long Island, New York
- 05/08/98        "Fitness Over Forty and Fifty"  
Lincoln-Sudbury Auxiliary Board Meeting  
Pierce House, Lincoln
- 04/24/98        "The Concussion Controversy/Grading and Return to Play"  
Sports Medicine Update '98 and NEACSM Spring Meeting  
Sunrise/Mediplex, Concord, MA  
Program Co-chair
- 04/07/98        "Living With Low Back Pain"  
Emerson Hospital Community Lecture Series  
Emerson Hospital  
Concord, Massachusetts
- 03/17/98        "Head Injury in Sports"  
Boston Medical Center  
Department of Rehabilitation Medicine  
Boston, Massachusetts
- 03/07/98        "Safety Issues In Boxing Regarding Head Injury"  
Sports Related Concussion and Nervous System Injuries  
Orlando Regional Healthcare System  
Caribe Royale Resort  
Lake Buena Vista, Florida
- 02/06/98        "Neurologic and Vascular Causes of Upper Extremity Problems  
(Cervical Spine Stingers, Peripheral Nerve, Brachial Plexus, Thoracic Outlet)  
American College of Sports Medicine's Team Physician Course  
San Diego Princess Resort  
San Diego, California
- 02/06/98        "Cervical Spine Injury, Extra Axial Facet, Disk, Radicular Symptoms, and Transient Quadriplegia"  
American College of Sports Medicine's Team Physician Course  
San Diego Princess Resort  
San Diego, California

- 02/06/98        “Epilepsy and Sports Participation”  
American College of Sports Medicine’s Team Physician Course  
San Diego Princess Resort  
San Diego, California
- 02/06/98        “Concussion: Definition, Classification, and Return to Play”  
American College of Sports Medicine’s Team Physician Course  
San Diego Princess Resort  
San Diego, California
- 02/06/98        “Problems and Perils in On-field Management of Head and Neck Injury”  
Hands-on Exam Workshop  
American College of Sports Medicine’s Team Physician Course  
San Diego Princess Resort  
San Diego, California
- 02/06/98        “Physical Examination of the Cervical Spine”  
Hands-on Exam Workshop  
American College of Sports Medicine’s Team Physician Course  
San Diego Princess Resort  
San Diego, California
- 01/31/98        “Concussion/Closed Head Trauma/Convulsions”  
Panel Discussion  
The Jockey Club/Concussion and Head in Sport  
The Gloucester Hotel  
Harrington Gardens  
London, England
- 01/30/98        “Concussion in Sport and the Second Impact Syndrome”  
The Jockey Club/Concussion and Head in Sport  
The Gloucester Hotel  
Harrington Gardens  
London, England
- 10/18/97        “The On-Field Management of Athletic Head and Spine Injuries”  
ACC Keynote Address  
New Zealand Sports Medicine Partners In Performance Conference  
Millennium Hotel  
Christchurch, New Zealand
- 10/18/97        “Second Impact Syndrome:”  
ACC Keynote Address  
New Zealand Sports Medicine Partners in Performance Conference  
Millennium Hotel  
Christchurch, New Zealand
- 10/17/97        “When To Return to Collision Sports After Concussion”  
ACC Keynote Address: Tom Anderson Trust Lecture  
New Zealand Sports Medicine Partners in Performance Conference  
Millennium Hotel  
Christchurch, New Zealand

- 10/16/97 "The Return to Sport After Cervical Spine Injury"  
Sports Physician Day  
New Zealand Sports Medicine Partners in Performance Conference  
Millennium Hotel  
Christchurch, New Zealand
- 10/14/97 "Catastrophic Sports Injuries"  
New Zealand Sports Medicine Conference  
Hawkes Bay Chapter  
Hawkes Bay, New Zealand
- 10/14/97 "Second Impact Syndrome"  
Grand Rounds Presentation  
Napier Hospital  
Napier, New Zealand
- 10/13/97 "When to Return to Competition After Head and Spine Injury"  
New Zealand Sports Medicine Conference  
Whangarei, New Zealand
- 09/25/97 "Athletic Head Injury Guidelines"  
New England American College of Sports Medicine: Fall Meeting  
Rhode Island Convention Center  
Providence, R.I.
- 05/22/97 "Head Injury In Football"  
American College of Sports Medicine: Annual Meeting  
Denver, Colorado
- 05/01/97 "Should There Be An Age Limit in Boxing"  
WBC: First Medical Conference on Boxing Safety  
Aruba
- 03/14/97 "Head Injury in Boxing"  
Ringside Physician Course  
Colorado Springs, Colorado
- 02/10/97 "Concussion Guidelines: Controversies and Implementation"  
Allegheny General Hospital Sports Medicine Meeting  
Caribe Royale Resort  
Lake Buena Vista, Florida
- 01/12/97 "Neurological Injuries and the Athlete"  
Breakfast Seminar  
AANS 65<sup>th</sup> Annual Meeting  
Colorado Convention Center  
Denver, Colorado
- 11/22/96 "Catastrophic Head Injury"  
Oklahoma Spine Institute  
Oklahoma City, Oklahoma

11/08/96	“Head and Face Protection for the Athlete” <u>New England American College of Sports Medicine: Fall Meeting</u> Boxboro, MA
10/26/96	“Ask the Experts” Fitness and Beauty Cruise Norwegian Cruise Line
10/23/96	“Weekend Warrior Woes” Fitness and Beauty Cruise Norwegian Cruise Line
10/22/96	“Exercise for Health versus Fitness” Fitness and Beauty Cruise Norwegian Cruise Line
10/02/96	“Head Injury and the Athlete” <u>Pediatric Day Conference</u> Waterbury, CT
06/01/96	“Boxing and Medicine” <u>American College of Sports Medicine: Annual Meeting</u> Cincinnati, OH
05/31/96	“On-the-Field Evaluation of Head and Neck Injuries” Clinical Workshop <u>American College of Sports Medicine: Annual Meeting</u> Cincinnati, OH
05/31/96	“Positive and Negative Effects of Head Protection” NCAA Colloquium <u>American College of Sports Medicine: Annual Meeting</u> Cincinnati, OH
05/29/96	“Management of Head and Neck Injuries” <u>American College of Sports Medicine: Annual Meeting</u> Cincinnati, OH
5/18/96	“Head and Neck Injuries in Sports: Assessment in On-The-Field Management” Sports Medicine For The Rheumatologist <u>American College of Rheumatology</u> Phoenix, AZ
4/27/96	“Diffuse Brain Injuries”; “Spinal Stenosis, Cord Neuropraxia, Transient Quadriplegia”; “Athletic Injuries of the Head and Neck” <u>The William W. Backus Hospital Trauma Department Program</u> Foxwoods Resort Casino, CT
03/14/96	“Boxing Injuries” <u>Emory University School of Medicine</u> Summer Games: Sports Medicine Review Atlanta, GA

- 02/09/96           “Concussion: Definition, Classification, and Return to Play”;  
               “Epilepsy and Sports Participation”;  
               “Cervical Spine Injury, Extra Axial Facet, Disk, Radicular  
               Symptoms, and Transient Quadriplegia”;  
               “Neurologic and Vascular Causes of Upper Extremity Problems  
(Cervical Spine, Stringers, Peripheral Nerve, Brachial Plexus, Thoracic Outlet)”;  
               “Hands-on Workshop - Physical Examination of the Spine”  
American College of Sports Medicine: Team Physician Course - Part I  
San Diego, CA
- 01/27/96           “Strength Aerobics - The Next Stage in Personal Fitness”  
McKenzie Speaker  
Sports Injuries Update  
Lake Placid Sports Medicine Society Conference  
Lake Placid, NY
- 01/26/96           “Epidemiology and Pathophysiology of Athletic Head Injury”  
“Acute Assessment of Athletic Head and Neck Injuries”  
“Surgical Treatment of Athletic Head and Spine Injuries:  
Who can Safely Return to Competition”  
Sports Injuries Update  
Lake Placid Sports Medicine Society Conference  
Lake Placid, NY
- 01/25/96           “Athletic Neck and Cervical Spine Trauma”  
Albany Medical College  
Albany, NY
- 01/07/96           “Second Impact Syndrome”  
Eastern Athletic Trainers Association Annual Meeting  
Boston, MA
- 12/14/95           “Catastrophic Head and Neck Injury in Sports”  
“Evaluation of Current Guidelines for Head Injury in Sports”  
“General Spinal Stenosis in Contact Sports”  
Rehabilitation Sports Medicine VIII: Controversies in Sports Medicine.  
The Rehabilitation Institute of Chicago  
Chicago, IL
- 11/09/95           “Strength Aerobics”  
Walden Rehabilitation & Nursing Center  
Concord, MA
- 10/23/95           “Weekend Warrior Woes: How to Avoid Exercise Injuries”  
Fitness and Beauty Cruise  
Norwegian Cruise Line
- 10/22/95           “Exercise for Health vs Fitness (How Much is Enough?)”  
Fitness and Beauty Cruise  
Norwegian Cruise Line
- 10/13/95           “Closed Head Injury”  
“Transient Quadriplegia in Sports”

Together in College Health: Surviving and Thriving  
Combined Annual Meeting: New York State Health Association and New England College Health Association  
Tarrytown, NY

- 10/11/95        "Catastrophic Sports Injuries: Functional Spinal Stenosis"  
                  "Sudden Death Syndrome"  
Emerson Hospital Neurology Conference  
Concord, MA
- 08/24/95        "Torso and Genitourinary Tract Injuries"  
Medicine in the Last Frontier/Medical World Conference  
Alaska
- 08/24/95        "A Team Physician's Sports Medicine Bag"  
Medicine in the Last Frontier/Medical World Conference  
Alaska
- 08/21/95        "Sports Injuries in Young Athletes"  
Medicine in the Last Frontier/Medical World Conference  
Alaska
- 08/21/95        "How to Write a Precise Aerobic Exercise Prescription"  
Medicine in the Last Frontier/Medical World Conference  
Alaska
- 08/20/95        "Conditioning of Cardiovascular System: A Machiavellian Approach to Health"  
Medicine in the Last Frontier/Medical World Conference  
Alaska
- 06/14/95        "Guidelines for Return to Competition After Mild Brain Injury in Sports"  
National Athletic Trainers' Association  
Indianapolis, IN
- 06/02/95        "On-The-Field Evaluation of Head and Neck Injuries"  
Clinical Workshop  
American College of Sports Medicine: Annual Meeting  
Minneapolis, MN
- 05/23/95        "Trauma to the Head and Spine"  
Connecticut Athletic Trainers' Association  
New Britain, CT
- 05/13/95        "Cervical Radiculopathy - Painless vs. Painful: A Conceptual Model and Management Approach"  
1<sup>st</sup> Annual Combined Meeting - Puget Sound & Portland Spine Interest Groups  
Seattle, WA
- 05/07/95        "Current Treatment Recommendations for Concussions and the Burner Syndromes"  
Prevention and Management of High School Football Injuries  
Salem Orthopedic Surgeons, Inc.  
Waltham, MA

- 04/28/95            "Management of Sports-Related Spine Injuries"  
Keynote Address  
Contemporary Management of Lumbar Spine Disorders  
The NeuroScience Institute at Mercy  
Oklahoma City, OK
- 04/23/95            "Assessment of Acute and Repetitive Head Injuries";  
"Management of Cervical Injuries"  
Clinical Congress: Decision Making and Sports Injuries  
Braintree Hospital Rehabilitation Network  
Randolph, MA
- 04/21/95            "Return to Play Criteria After Cervical Spine Injury"  
"Cervical Spine Injuries Workshop: Case Studies and Discussion"  
Controversies in Decision Making: Neurological Sports Injuries  
University of Miami School of Medicine  
Lake Buena Vista, FL
- 04/01/95            "Exercise for Health vs Fitness"  
Mens Health Day  
Emerson Hospital  
Concord, MA
- 03/03/95            "Catastrophic Injury of the Brain and Spinal Cord"  
Ninth Annual Neurologically Impaired Individual Symposium  
St. Mary's Hospital  
Richmond, VA
- 02/21/95            "Head Injuries"  
Department of Physical Medicine & Rehabilitation  
Resident Didactic Seminars  
Tufts University School of Medicine  
Newton Wellesley Hospital  
Natick, MA
- 02/15/95            "Chest and Abdominal Injuries"  
Sports Medicine: An In-Depth Review  
American Academy of Family Physicians  
Dallas, TX
- 02/14/95            "Closed Head Injuries"  
"Entrapment Neuropathies"  
"Spine: History and Exam Skills Workshop"  
Sports Medicine: An In-Depth Review  
American Academy of Family Physicians  
Dallas, TX
- 01/25/95            "Athletic Head and Spine Injuries: Recognition of  
On-The-Field Care and Return to Play Guidelines"  
Sports Medicine Symposium 1995  
North Broward Medical Center  
Pompano Beach, FL

- 12/07/94      "The Prevention of Sports Related Neurological Injuries in American Football: Rules, Equipment, and Surfaces";  
"Guidelines for Return to American Football After an Episode of Transient Quadriplegia"  
American Society for Testing and Materials Symposium on Safety in American Football  
Phoenix, AZ
- 11/19/94      "Prevention, Treatment, and Return to Play Criteria for Head & Neck Injuries in Sports"  
"ACSM and the Sports Medicine Professional"  
Greater New York Regional Chapter American College-of-Sports Medicine  
New York, NY
- 11/04/94      "When to Return to Contact Collision Sports After an Episode of Transient Quadriplegia"  
New England Chapter American College of Sports Medicine  
Boxborough, MA
- 09/14/94      "Spinal Stenosis"  
Emergency Department Medical Staff Conference  
Emerson Hospital  
Concord, MA
- 06/11/94      "Assessment and Treatment of Traumatic Cervical Spine/Cord Injury"  
"Guidelines for Return to Contact Collision Sports After Traumatic Cervical Spine/Cord Injury"  
National Athletic Trainers Association Annual Meeting and Clinical Symposium  
Dallas, TX
- 06/04/94      "On-the-Field Evaluation and Management of Head and Spinal Cord Injury"  
American College of Sports Medicine: Annual Meeting  
Indianapolis, IN
- 06/03/94      "Concussion: Management and Return to Competition"  
American College of Sports Medicine: Annual Meeting  
Indianapolis, IN
- 06/02/94      "Traumatic Fatal and Non-Fatal Catastrophic Sports Injuries"  
American College of Sports Medicine: Annual Meeting  
Indianapolis, IN
- 06/02/94      "Cervical Spinal Stenosis and Contact Sports"  
American College of Sports Medicine: Annual Meeting  
Indianapolis, IN
- 05/20/94      "Return to Sport After Head Injury"  
"Head and Neck Injuries"  
"The Preparticipation Examination"  
Caribbean Sports Medicine Congress  
Bridgetown, Barbados, WI
- 04/17/94      "Cerebral Concussion in Sport: Prevention and Management"  
Mild Brain Injury Summit National Athletic Trainers Association  
Washington, D.C.

- 03/23/94 "Neck Injuries: The Great Debate: Personal Experience and Perspectives of Our Experts"  
Panelist: Neck Injuries Workshop Case Studies and Discussion  
Controversies in Decision Making: Neurological Sports Injuries  
University of Miami School of Medicine and the Miami Project to Cure Paralysis  
Lake Buena Vista, FL
- 03/22/94 "Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and Why"  
"When to Return to Contact/ Collision Sports After Head and Spine Injury"  
16th Annual Family Practice Review  
Bayfront Medical Center  
St. Petersburg Beach, FL
- 03/21/94 "When is it Safe to Return to Contact Sports?"  
Panelist: Head Injury Workshop - Case Studies and Discussion  
Controversies in Decision Making: Neurological Sports Injuries  
University of Miami School of Medicine and the Miami Project to Cure Paralysis  
Lake Buena Vista, FL
- 03/20/94 "Prevention of Sports-Related Neurological Injuries: Rules, Equipment, and Surfaces,"  
Moderator: Peripheral Nerve Injuries Workshop - Case Studies and Discussion  
Controversies in Decision Making: Neurological Sports Injuries  
University of Miami School of Medicine and the Miami Project to Cure Paralysis  
Lake Buena Vista, FL
- 03/12/94 "Acute and Second Impact Syndrome Head Injury"  
First Annual Ringside Physicians Course  
United States Amateur Boxing, Inc.  
Colorado Springs, CO
- 03/08/94 "Health Benefits of Physical Fitness,"  
Second Annual New Dimensions in Research Conference  
Mabon Securities Corporation  
Beaver Creek, CO
- 03/05/94 "Managing Head and Neck Injuries"  
Sports Med Boston: "New Options for Treating the Injured Athlete"  
Back Pain Society  
Danvers, MA
- 01/21/94 "Neck Injuries"  
Sport Med 94  
Toronto, Canada
- 01/21/94 "Head Injuries in Sport"  
The Tom Pashby Sport Safety Fund Lecture  
Sport Med 94  
Toronto, Canada
- 11/19/93 "When is it Safe to Return to Contact Sports After a Head Injury"  
American Medical Tennis Association Omni Specialty Sports Medicine Update  
Palm Springs, CA

- 11/18/93      "When is it Safe to Return to Contact Sports After a Cervical Spine Injury?"  
American Medical Tennis Association Omni Specialty Sports Medicine Update  
Palm Springs, CA
- 11/09/93      "The Female Triad: Disordered Eating, Amenorrhea, and Osteoporosis"  
Community Health Education Program  
Emerson Hospital  
Concord, MA
- 09/06/93      "Head and Neck Injury"  
XV<sup>th</sup> World Congress of Neurology  
Vancouver, B.C., Canada

- 08/14/93      "Epidemiology, Recognition and Acute Management of Closed Head Injury/ Concussion"  
"Return to Competition After Head Injury"  
"Fractures and Dislocations of Cervical Spine"  
"Epidemiology, Evaluation and Treatment of Traumatic Spinal Cord Injury:  
Return to Competition"  
"Case Presentations: Transient Quadriplegia"  
ACSM CAQ Board Review Course for the Certification Examination  
in Sports Medicine  
San Francisco, CA
- 08/13/93      "Functional Anatomy & Biomechanics:  
Examination of the Patient with Low Back Pain"  
"Lumbar Spinal Stenosis: Dx and Management"  
"Indications for Surgery and Return to Competition After Lumbar Spine Injury"  
"Legal Aspects of Sports Medicine and Role of the Team Physician"  
"On-field Management and Evaluation of Acute Spinal Cord Trauma"  
ACSM CAQ Board Review Course for the Certification Examination  
in Sports Medicine  
San Francisco, CA
- 06/11/93      "Case Studies: Epidemiology, Assessment, and Return to Play Criteria  
for Head Injuries in Sports"  
National Athletic Trainers Association Annual Meeting and Clinical Symposium  
Kansas City, MO
- 06/05/93      "Spinal Stenosis: Transient Quadriplegia and Football"  
40th Annual Meeting American College of Sports Medicine  
Seattle, WA
- 06/03/93      "Physician Continuing Medical Education and Opportunities"  
Symposium: 40th Annual Meeting American College of Sports Medicine  
Seattle, WA
- 05/20/93      "Where is Boxing in This Process?"  
International Symposium on Head and Neck Injuries in Sports American Society for Testing  
and Materials  
Atlanta, GA
- 05/14/93      "Sports Medicine in Primary Care"  
"Athletic Catastrophic Sports Injury Study (1931-1987):  
Which Sports Are at Greatest Risk and What is Being Done to Reduce Injury"  
"Medical Coverage of Games and Events"  
"Legal Liabilities of the Team Physician"  
"How to Live Painlessly With Your Low Back Disorder"  
Fourth Annual Sports Medicine Conference on the Beach Halifax Medical Center Family Practice  
Residency Program  
Daytona Beach, FL
- 05/07/93      "Women's Triad"  
Conference Chairman  
Eighth Annual Sports Medicine Update 93  
Westford, MA

- 05/06/93        "Returning to Contact Sports After a Head Injury:  
                    Relative and Definite Contraindications"  
Department of Pediatrics, Emerson Hospital  
Concord, MA
- 04/15/93        "The Prevention and Treatment of Athletic Spine Injuries"  
Grand Rounds  
Nashua Memorial Hospital, NH
- 03/06/93        "Specific Problems and Pearls in Boxing"  
"Indications for Surgery and Return to Competition After Lumbar Spine Injury"  
Team Physician Course Parts II and III: American College of Sports Medicine  
Orlando, FL
- 03/05/93        "Transient Quadriplegia (Symptoms, Pathomechanics, Work-up, Return to Play,  
Controversies, Case Presentations and Discussion)  
(With Stanley A. Herring, M.D.)  
Team Physician Course Part III: American College of Sports Medicine  
Orlando, FL
- 03/04/93        "Brachial Plexus Injuries"  
"Epidemiology, Recognition, and Acute Management of Head Injuries"  
"Return to Play Criteria After Head Injury"  
"Epilepsy and the Athlete"  
Team Physician Course Part II and III: American College of Sports Medicine  
Orlando, FL
- 03/02/93        "Toward a Lifetime of Family Fitness"  
Health and Fitness in the 90's  
The Thoreau Club of Concord  
Concord, MA
- 02/23/93        "Legal Liabilities of the Team Physician"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Scottsdale, AZ
- 02/22/93        "Epilepsy and the Athlete"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Scottsdale, AZ
- 01/29/93        "Catastrophic Sports Injuries: Which Sports are at Greatest Risk and Why?"  
Southeast Regional Chapter: American College of Sports Medicine  
Norfolk, VA
- 01/29/93        "Medical Risks of Boxing/Is Boxing a Sport?"  
Southeast Regional Chapter: American College of Sports Medicine  
Norfolk, VA
- 01/25/93        "Head and Spine Injuries in Athletes"  
Chelmsford High School  
Chelmsford, MA

- 01/23/93 "Head and Neck Injuries in Athletes"  
Comprehensive Review Course in Sports Medicine  
The College of Physicians and Surgeons  
Department of Orthopaedic Surgery  
Columbia University, New York  
Barbados, West Indies
- 01/12/93 "Women's Health Issues: Ask the Doctor"  
Health and Fitness in the 90's  
The Thoreau Club of Concord  
Concord, MA
- 12/23/92 "Overview of Head Injuries in the Athlete,"  
St. Vincent Hospital Grand Rounds  
Worcester, MA
- 11/18/92 "Head and Neck Injury Reduction in Football: A Sixty-Year Effort"  
American Medical Tennis Association  
Palm Springs, CA
- 11/13/92 "Low Back Pain: Etiology, Diagnosis, and Treatment"  
"Spinal Cord Injuries"  
American Academy of Family Physicians 6th Annual Family Practice Weekend & Sports Medicine Conference  
Huntington, WV
- 11/10/92 "Exercise: What's the Right Dosage for You?"  
Health and Fitness in the 90's  
The Thoreau Club of Concord  
Concord, MA
- 10/14/92 "Cervical Spine Injuries"  
Australian College of Sports Physicians: National Annual Scientific Conference in Sports Medicine  
Perth, Western Australia
- 10/13/92 "The Team Physician"  
Australian College of Sports Physicians: National Annual Scientific Conference in Sports Medicine  
Perth, Western Australia
- 10/12/92 "Catastrophic Sports Injuries"  
Keynote Address  
Australian College of Sports Physicians: National Annual Scientific Conference in Sports Medicine  
Perth, Western Australia
- 10/06/92 "Signs and Symptoms of Anabolic Steroid Abuse"  
Commonwealth of Massachusetts  
Project Alliance Training Program  
Burlington, MA

- 08/22/92 "Back Injuries in Tennis Players"  
Society of Tennis Medicine and Science  
Yale University  
New Haven, CT
- 07/23/92 "Fitness for Good Health"  
Concord Prison Outreach  
Concord, MA
- 06/05/92 "Serious Head and Neck Injury Reduction in Football - A 60-Year Effort"  
New England Neurosurgical Society,  
Waltham, MA
- 05/29/92 "Head Injury in Sports"  
39th Annual Meeting American College of Sports Medicine  
Dallas, TX
- 05/28/92 "Team Physician Certification,"  
39th Annual Meeting American College of Sports Medicine  
Dallas, TX
- 05/27/92 "Head, Neck, and Spine: Head and Neck Injury"  
Chair: Physician Case Presentations  
39th Annual Meeting American College of Sports Medicine  
Dallas, TX
- 05/13/92 "Steroid Abuse in the Athlete"  
Spring Symposium on Sports Medicine  
Milford Whitinsville Regional Hospital  
Milford, MA
- 05/01/92 "The Anabolic Steroid Epidemic"  
7th Annual Sports Medicine Update 92  
Westford, MA
- 04/14/92 "Disc Herniation in the Athlete: When to Operate?";  
"On-field Emergencies to the Spine and Neck"  
The National Sportsmedicine Conference '92  
Orlando, FL
- 03/11/92 "Steroids - The Threat and Dangers,"  
Assabet Valley Regional Vocational School  
Marlborough, MA
- 02/26/92 "Lumbar Spinal Stenosis: Evaluation and Treatment"  
Leominster Hospital Grand Rounds  
Leominster, MA
- 02/24/92 "Head Trauma in Adolescents"  
Medical Student Education  
Emerson Hospital  
Concord, MA

- 02/02/92            “Sports Medicine-Sports Science: Bridging the Gap”;  
                      “Head, Neck, and Extraspinal Nerve Injury in Contact Sports”;  
                      “Acute and Chronic Brain Injuries in Boxing and Other Collision Sports”;  
                      “Return to Collision Sports After Athletic Cervical and Lumbar Spine Injury”  
Third National Kaiser Permanente Sports Medical Conference  
Snowbird, UT
- 01/13/92            “Steroids - The Threat and Dangers”  
Marlborough High School Athletic Department  
Marlborough, MA
- 12/14/91            “Epidemiology, Assessment, and Criteria for Return to Play in Cervical Spine Injuries”;  
“Epidemiology, Assessment, and Return to Play Criteria for Head Injuries in Sports”  
Rehabilitation Sports Medicine IV: Injuries to the Head and Neck in Sports  
Rehabilitation Institute of Chicago  
Chicago, IL
- 12/04/91            “Steroids - The Threat and Dangers”  
Sports Injury Symposium: The Massachusetts Interscholastic Athletic Association  
Waltham, MA
- 11/22/91            “Anabolic Steroid Abuse in Athletics”  
American Medical Tennis Association  
Palm Springs, CA
- 11/21/91            “Catastrophic Sports Injuries in High School and College Sports”  
American Medical Tennis Association  
Palm Springs, CA
- 10/22/91            “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and What is Being Done to  
Reduce Injury”  
Harvard Community Health Plan  
Wellesley, MA
- 10/19/91            “Etiology, Biomechanics, Diagnosis, and Treatment of Athletic Low Back Pain”  
University of Texas Health Center  
Tyler, TX
- 10/18/91            “Etiology, Biomechanics, Diagnosis, and Treatment of Athletic Low Back Pain”  
Tom Landry Sports Medicine Center  
Dallas, TX
- 10/18/91            “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and What is Being Done to  
Reduce Injury”  
Texas College of Osteopathic Medicine  
Fort Worth, TX
- 10/17/91            “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and What is Being Done to  
Reduce Injury”  
Texas A&M University  
College Station, TX

- 10/17/91 "Etiology, Biomechanics, Diagnosis, and Treatment of Athletic Low Back Pain"  
Texas Woman's University  
Houston Center, TX
- 10/10/91 "Head and Spine Injuries in Athletes"  
Maine Medical Center  
Portland, ME
- 09/27/91 "Catastrophic Sports Injuries: Sports at Risk?"  
Medical Staff Clinical Meeting  
Emerson Hospital  
Concord, MA
- 09/08/91 "Catastrophic Spinal Injuries in Scholastic Sports"  
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention  
Las Vegas, NV
- 09/07/91 "The Boxing Controversy: A Neurosurgeon's Perspective"  
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention  
Las Vegas, NV
- 09/07/91 "When To Return to Collision Sports After Athletic Head and/or Cervical Spine Injury"  
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention  
Las Vegas, NV
- 09/06/91 "Catastrophic Spine Injuries in Scholastic Sports: Which Are at Greatest Risk and What is Being Done to Reduce Injury"  
1991 Presidential Guest Lecturer  
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention  
Las Vegas, NV
- 07/27/91 "Low Back Pain: Etiology, Diagnosis, and Treatment"  
The Burdenko Water and Sports Therapy Institute  
Boston, MA
- 07/27/91 "Catastrophic Spine Injuries in All School Sports"  
American Academy of Sports Physicians  
Boston, MA
- 06/12/91 "Health Effects of Regular Exercise"  
Concord Prison Outreach  
Concord, MA
- 06/07/91 "Acute and Chronic Brain Injury in Contact Sports";  
"Evaluation of the Athlete for Return to Sports After Concussion"  
Snake River Medical Forum  
Lewiston, ID

- 06/01/91        “Boxing - A Historical Perspective”;  
                “Professional Boxing - One Neurosurgeon’s Viewpoint”  
American College of Sports Medicine Annual Meeting  
Orlando, FL
- 05/31/91        “Criteria For Return to Play Following Cervical Injuries”  
American College of Sports Medicine Annual Meeting  
Orlando, FL
- 05/17/91        “Carotid Artery Stenosis”  
Medical Staff Clinical Scientific Meeting  
Emerson Hospital  
Concord, MA
- 05/07/91        “Sports Injuries”  
Milford Regional Hospital Grand Rounds  
Milford, MA
- 05/03/91        “When to Return to Competition after Head and Cervical Spine Injury”;  
“Anatomy, Biomechanics, Diagnosis, and Management of Athletic Low Back Pain  
Sixth Annual Sports Medicine Update 91  
Westford, MA
- 05/02/91        “Life-threatening Injuries to the Head and Neck”  
Minnesota Academy of Family Physicians  
Minneapolis, MN
- 04/24/91        “Catastrophic Spine Injuries in All School Sports (1982-1989)  
American Association of Neurological Surgeons  
New Orleans, LA
- 04/12/91        “Low Back Pain: Etiology, Diagnosis, and Treatment”  
National Sports Medicine Conference On The Beach  
Halifax Medical Center  
Family Practice Residency Program  
Daytona Beach, FL
- 03/26/91        “Recognition and Management of Head Injuries”;  
“Peripheral Nerve Entrapment”  
American College of Sports Medicine Team Physician Course  
Orlando, FL
- 03/24/91        “Cord and Peripheral Nerve”;  
“Spinal Stenosis: How to Evaluate”;  
“On-the-Field Management of Acute Spinal Cord Injury”  
American College of Sports Medicine Team Physician Course  
Orlando, FL
- 03/14/91        “Catastrophic Sports Injuries in High School and College Sports”  
Massachusetts Association for Health, Physical Education, Recreation and Dance,  
1991 Annual Convention  
Randolph, MA

- 02/11/91        “Anatomy and Biomechanics of Athletic Cervical Spine & Head Injury”;  
“Intraspinal and Extraspinal. Cervical Spine Injuries - Diagnosis and Management”  
Second National Kaiser Permanent Sports Medicine Conference  
Snowbird, UT
- 02/10/91        “Anatomy, Biomechanics, Diagnosis and Management of Low Back Pain”  
Second National Kaiser Permanent Sports Medicine Conference  
Snowbird, UT
- 02/01/91        “Spinal Stenosis: Identification and Therapy,”  
Medical Staff Scientific Meeting  
Emerson Hospital  
Concord, MA
- 01/10/91        “Lumbar Spinal Stenosis: Evaluation and Treatment/ Surgical Indications”  
Buffalo General Hospital Grand Rounds  
Buffalo, NY
- 01/10/91        “Diabetes and Exercise”  
Mercy Hospital Grand Rounds  
Buffalo, NY
- 01/09/91        “How to Live Painlessly With Your Low Back Disorder”  
South Town Physicians  
Blasdell, NY
- 12/04/90        “Feeling Fit for Life”  
Community Health Lecture Series  
Emerson Hospital  
Concord, MA
- 11/30/90        “Catastrophic Sports Injuries in High School and College Athletes”  
American Medical Tennis Association  
Palm Springs, CA
- 11/29/90        “Sports Medicine in Primary Care”  
American Medical Tennis Association  
Palm Springs, CA
- 11/26/90        “Neurologic Injuries: Assessment/Care at Scene of Injury”  
Littleton Fire Department - EMT  
Littleton, MA
- 11/17/90        “Epidemiology of Head Injuries in Sports and Return to Play Decision Making”  
Swedish Hospital Medical Center  
Spine Institute Fall Symposium  
Seattle, WA
- 11/16/90        “Epidemiology of Spinal Cord Injuries and Assessment of Intraspinal Injuries in Sports”  
Swedish Hospital Medical Center  
Spine Institute Fall Symposium  
Seattle, WA

- 11/07/90 "Steroid Abuse in the Athlete";  
"Cranial and Cervical Injuries in Sports"  
Hahnemann University School of Medicine  
Philadelphia, PA
- 11/03/90 "Sports Injuries to the Lower Extremities""  
Nurse Practitioner Associates for Continuing Education National Primary Care Conference  
Boston, MA
- 10/22/90 "Neurosurgical Athletic Injuries"  
Congress of Neurological Surgeons  
Los Angeles, CA
- 10/16/90 "Osteoarthritis Due to Sports-related Injuries"  
Framingham Union Hospital Grand Rounds  
Framingham, MA
- 10/12/90 "Sports Injuries and Low Back Pain"  
Bethany Medical Conference  
Bethany Medical Center  
Kansas City, KS
- 10/12/90 "Sports Injuries"  
Trinity Lutheran Hospital  
Kansas City, MO
- 10/11/90 "Prevention and Treatment of Catastrophic Sports Injuries"  
Kansas University Medical Center;  
Kansas City, MO
- 10/11/90 "Arthritic Low Back Pain"  
Topeka Veterans Administration Hospital  
Topeka, KS
- 10/11/90 "Low Back Pain - Management and Exercise of Diabetic Patients"  
Providence - St. Margaret's Hospital  
Kansas City, KS
- 10/11/90 "How to Live Painlessly with Arthritic Low Back Pain"  
Shawnee Mission Medical Center  
Overland Park, KS
- 07/25/90 "Sports Medicine and Primary Care"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 07/24/90 "Anabolic Steroid Abuse in Athletics"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH

- 07/23/90            "Catastrophic Sports Injuries in High School and College Sports"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 07/14/90            "Management of Osteoarthritic Sports Injuries"  
Health-in-Action Day  
Stratton Mountain, VT
- 07/11/90            "Health Benefits of Exercise"  
New England Correctional Center  
Concord, MA
- 05/24/90            "Intracranial Athletic Cervical Spine Injury"  
Symposium Co-chairman: Athletic Cervical Spine Injury  
American College of Sports Medicine Annual Meeting  
Salt Lake City, UT
- 05/24/90            "On-the-Field Evaluation of Head and Spine Injuries"  
Clinical Workshop  
American College of Sports Medicine Annual Meeting  
Salt Lake City, UT
- 05/23/90            "Neck Pain - Soccer"  
American College of Sports Medicine Annual Meeting  
Salt Lake City, UT
- 05/23/90            "On-the-Field Evaluation of Head and Spine Injuries"  
Clinical Workshop  
American College of Sports Medicine Annual Meeting  
Salt Lake City, UT
- 05/22/90            "Head Injuries in Sports: Biomechanics, Prevention, and Treatment"  
Clinical Lecture  
American College of Sports Medicine Annual Meeting  
Salt Lake City, UT
- 05/07/90            Medical Resource for Breakout Medical Session  
National Catastrophic Head/Spinal Cord Sports Injury Consensus Meeting  
National Federation of State High School Associations  
Kansas City, MO
- 05/04/90            "Catastrophic Sports Injuries"  
Conference Chairman  
Sports Medicine Update 90  
Westford, MA
- 04/30/90            "The Athlete and the Neurosurgeon"  
Breakfast Seminar Panel Chairman  
American Association of Neurological Surgeons  
Nashville, TN
- 04/23/90            "Diagnosis, Prevention, and Treatment of Athletic Spine Injuries"  
Kaiser Permanente HMO  
Holyoke, MA

04/18/90	“Burners/ Stingers /Cervical Spine Injuries”; “Concussions” <u>First Annual Sports Medicine Conference on the Beach</u> Halifax Medical Center Family Practice Residency Program Daytona Beach, FL
04/06/90	“Sports Medicine: Bridging the Gap” Penobscot Bay Medical Center Rockland, ME
04/05/90	“Low Back Pain: Etiology, Diagnosis, and Treatment” Eastern Maine Medical Center Bangor, ME
03/30/90	“Cervical and Low Back Pain: Diagnosis and Treatment” St. Vincent Hospital Family Practice Residency Program Erie, PA
03/30/90	“Catastrophic Sports Injuries” Hamot Family Practice Erie, PA
03/30/90	“Low Back Pain: Etiology, Diagnosis, and Treatment” Millcreek Community Hospital Erie, PA
03/29/90	“Low Back Pain: Etiology, Diagnosis, and Treatment” Aviation Country Club Erie, PA
03/23/90	“Low Back Pain: Etiology, Diagnosis, and Treatment” Hanscom Clinic - Hanscom Field Air Force Base Bedford, MA
02/09/90	“Catastrophic Football Spine Injuries; 1977-1988” <u>Joint Section on Disorders of the Spine and Peripheral Nerves</u> <u>American Association of Neurological Surgeons</u> Captiva Island, FL
02/03/90	“The Neurosurgeon and the Amateur Athlete” <u>Downeast Association of Physician Assistants Winter Conference</u> Bethel, ME
01/12/90	“Exercise for Health vs Fitness: How much is enough?” <u>Community Health Lecture Series</u> Emerson Hospital Concord, MA
10/24/89	“Adolescents and Anabolic Steroids” <u>Pediatric Grand Rounds</u> Baystate Medical Center Springfield, MA

- 10/17/89        "Prevention and Treatment of Spinal Injuries in Athletes"  
St. Francis Health Care Foundation Endowed Lecture Series  
St. Francis Hospital  
Poughkeepsie, NY
- 10/04/89        "Steroids - The Threat and Dangers"  
Massachusetts Interscholastic Athletic Association, Inc Annual Sports Injury Conference  
Milford, MA
- 09/23/89        "Indications/ Contra-Indications For Surgery in the Arthritic Patient"  
Health-in-Action Day  
Nova Scotia, Canada
- 09/16/89        "Rehabilitation at Fitness Centers"  
Sponsored by Nautilus Sports Medical Industries, Inc.  
Vista International Hotel  
Elizabeth, NJ
- 07/25/89        "Anabolic Steroid Abuse in Athletics"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 07/24/89        "Catastrophic Sports Injuries in High School and College Sports"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 06/13/89        "Case Presentations"  
Monroe County Highland Hospital Grand Rounds  
Rochester, NY
- 06/13/89        "Cervical and Low Back Spine"  
Monroe County Highland Hospital Grand Rounds  
Rochester, NY
- 06/12/89        "Cervical and Low Back Spine"  
Sponsored by Monroe County Highland Hospital Physicians Assistants  
Pittsford, NY
- 06/10/89        "Low Back Pain: Etiology, Diagnosis, and Treatment"  
Sheehan Memorial Hospital  
Buffalo, NY
- 06/10/89        "Low Back Pain: Etiology, Diagnosis, and Treatment"  
Our Lady of Victory Hospital Grand Rounds  
Lackawanna, NY
- 06/05/89        "Sports Medicine in Primary Care"  
Williamsville, NY
- 06/05/89        "Sports Medicine in Primary Care"  
Niagara Falls Memorial Hospital  
Niagara Falls, NY

05/05/89	“Steroid Abuse in Athletics” <u>Sports Medicine Update 89</u> Westford, MA
04/28/89	“Cervical and Lumbar Osteoarthritis,” <u>St. Anne’s Hospital Grand Rounds</u> Fall River, MA
04/24/89	“Medical Management of Low Back Pain” Hunt Memorial Hospital Danvers, MA
04/12/89	“Nutrition and Exercise For the Senior Citizen” Trinitarian Church Concord, MA
04/10/89	“Prevention and Treatment of Athletic Spine Injuries” Sponsored by Cooley Dickinson Hospital Northampton, MA
03/17/89	“Chronic Low Back Pain” <u>St. John’s Hospital Grand Rounds</u> Lowell, MA
03/16/89	“Low Back Pain: Etiology, Diagnosis, and Treatment” Mercy Hospital Buffalo, NY
03/16/89	“Prevention and Treatment of Athletic Spine Injuries” <u>Millard Fillmore Hospital Grand Rounds</u> Buffalo, NY
03/15/89	“Low Back Pain: Etiology, Diagnosis, and Treatment” Blasdell, NY
03/02/89	“Common Sports Injuries” Youville Hospital Cambridge, MA
02/24/89	“Catastrophic Sports Injuries” <u>6th Annual Office-Based Sports Medicine Conference</u> Sun Valley, ID Sponsored by University of California School of Medicine at San Francisco
02/24/89	“When to Return to Contact Sports After a Concussion” <u>6th Annual Office-Based Sports Medicine Conference</u> Sun Valley, ID Sponsored by University of California School of Medicine at San Francisco
02/24/89	“Athletic Low Back Pain” <u>6th Annual Office-Based Sports Medicine Conference</u> Sun Valley, ID Sponsored by University of California School of Medicine at San Francisco

- 02/22/89 "Acute and Chronic Brain Injuries in Boxing and Other Collision Sports"  
6th Annual Office-Based Sports Medicine Conference  
Sun Valley, ID  
Sponsored by University of California School of Medicine at San Francisco
- 02/22/89 "On-the-Field-Management of Athletic Head and Spine Injuries"  
6th Annual Office-Based Sports Medicine Conference  
Sun Valley, ID  
Sponsored by University of California School of Medicine at San Francisco
- 02/08/89 "Osteoarthritis of the Lumbar Spine"  
New Britain Hospital Grand Rounds  
New Britain, CT
- 02/08/89 "Sports Medicine In Primary Care"  
Stamford Hospital Grand Rounds  
Stamford, CT
- 02/07/89 "Feeling Fit After Forty"  
Community Health Lecture Series  
Emerson Hospital  
Concord, MA
- 02/03/89 "Osteoarthritis of the Lumbar Spine"  
Harvard Community Health Plan  
Braintree, MA
- 01/20/89 "Catastrophic Injuries in High School and College Athletes"  
The Second International Symposium on the Prevention of Catastrophic Sports and Recreational Injuries to the Spine and Head  
Toronto ,Canada
- 01/19/89 "Head Injuries: The Experience in the United States"  
The Second International Symposium on the Prevention of Catastrophic Sports and Recreational Injuries to the Spine and Head  
Toronto, Canada
- 01/18/89 "Steroid Abuse in Athletics"  
Sports Medicine Symposium Connecticut State Medical Society  
Choate School  
Wallingford, CT
- 01/17/89 "Catastrophic Sports Injuries"  
Connecticut State Medical Society  
Cheshire, CT
- 01/11/89 "Diagnosis and Treatment of Degenerative Cervical and Lumbar Spine Disease"  
Henry Heywood Hospital Grand Rounds  
Gardner, MA
- 01/11/89 "Athletic Low Back Pain"  
Sports Medicine Systems  
Newton, MA

12/20/88	“Low Back Pain” <u>Milford-Whitinsville Regional Hospital Grand Rounds</u> Milford, MA
12/10/88	“Head and Neck Injuries in Sports”; “On-the-Field Management of Head and Neck Injuries” <u>American Physical Therapy Association</u> Hilton Head Island, SC
11/21/88	“Women and Sports - Special Concerns” The Daisy Flour Mill Rochester, NY
11/21/88	“Sports Medicine In Primary Care” <u>Genesee Memorial Hospital Grand Rounds</u> Batavia, NY
11/11/88	“Which Sports Are At Greatest Risk and What Is Being Done”; “Sports Medicine-Sports Science: Bridging the Gap” <u>Kent County Hospital Grand Rounds</u> Warwick, RI
10/28/88	“Osteoarthritis Due To Spinal Injuries” <u>Cutler Army Hospital Grand Rounds</u> Fort Devens, MA
10/07/88	“Health Enhancement Through Physical Conditioning” Concord Fitness Club Concord, MA
10/05/88	“Head and Neck Injuries” <u>Sports Medicine Workshop</u> Boxborough, MA
09/29/88	“Arthritic Low Back Pain” <u>Health-In-Action Day</u> Boston, MA
09/22/88	“Prevention and Recognition of Athletic Head and Spine Injuries” <u>Sports Medicine Update: Prevention and Treatment of Fall Sports Injuries</u> Albany Medical College Albany, NY
09/13/88	“Emergency Care of the Injured Athlete” Littleton Junior-Senior High School Littleton, MA
08/12/88	“Osteoarthritis and Sports Injuries” <u>Brockton Hospital Grand Rounds</u> Brockton, MA

- 07/27/88            "Catastrophic Sports Injuries"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 07/26/88            "When To Return To Contact Sports After A Head Injury"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 07/25/88            "Prevention of Athletic Spine Injuries"  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
- 06/24/88            "The Diagnosis and Treatment of Degenerative Cervical and Lumbar Spine Disease"  
Binghamton General Hospital Grand Rounds  
Binghamton, NY
- 06/24/88            "Low Back Pain: Etiology, Diagnosis, and Treatment"  
Binghamton, NY
- 06/23/88            "Athletic Catastrophic Sports Injury Study (1931-1987):  
Which Sports Are At Greatest Risk and What Is Being Done To Reduce Injury"  
Binghamton, NY
- 06/17/88            "Osteoarthritis - As It Relates To Sports Injuries"  
St. John's Hospital Grand Rounds  
Lowell, MA
- 06/10/88            "Catastrophic Sports Injuries: Which Sports Are At Greatest Risk  
and What Is Being Done To Reduce Injury"  
Sports Medicine Update '88  
Westford, MA
- 05/31/88            "Head and Neck Injuries in Rugby"  
International Conference on Rugby Injuries  
Boston, MA
- 05/28/88            "Sudden Death - Ice Hockey"  
American College of Sports Medicine Annual Meeting  
Dallas, TX
- 05/28/88            "Catastrophic Sports Injuries: Which Sports Are At Greatest Risk  
and What Is Being Done To Reduce Injury"  
American College of Sports Medicine Annual Meeting  
Dallas, TX
- 05/27/88            "Discogenic Low Back Pain"  
American College of Sports Medicine Annual Meeting  
Dallas, TX
- 05/26/88            "Cervical Spine Evaluation"  
Clinical Workshop  
American College of Sports Medicine Annual Meeting  
Dallas, TX

- 05/26/88 "Headache and Convulsion - Aerobic Exercise"  
Clinical Lecture  
American College of Sports Medicine Annual Meeting  
Dallas, TX
- 05/25/88 "When to Return to Contact Sports After a Cerebral Concussion"  
Tutorial Lecture  
American College of Sports Medicine Annual Meeting  
Dallas, TX
- 04/28/88 "Football Catastrophic Sports Injury Experience 1987"  
Sports Medicine Section  
American Association of Neurological Surgeons  
Toronto, Canada
- 04/25/88 "When to Return to Contact Sports After Head Injury"  
Panel Chairman: Breakfast Seminar  
American Association of Neurological Surgeons  
Toronto, Canada
- 03/24/88 "High School and College Catastrophic Sports Injury Survey:  
Which Sports Are At Greatest Risk and What is Being Done To Reduce Injury"  
Drake University Sports Medicine Conference  
Des Moines, IA
- 03/24/88 Returning to Action After a Head Injury"  
Drake University Sports Medicine Conference  
Des Moines, IA
- 03/10/88 "Catastrophic Injuries in High School and College Athletes"  
Writer's Conference American College of-Sports Medicine  
New York, NY
- 03/05/88 "Return to Contact Sports After a Cerebral Concussion"  
Fitness in Sports Fourth Annual Conference  
Fort Worth, TX
- 02/09/88 "Feeling Fit After Forty"  
Community Health-Lecture Series  
Emerson Hospital  
Concord, MA
- 01/31/88 "Update on Field Management of Head and Neck Injury"  
1988 Lake Placid Sports Medicine Conference  
Lake Placid, NY
- 01/30/88 "Concussion in Athletes"  
1988 Lake Placid Sports Medicine Conference  
Lake Placid, NY
- 11/06/87 "Head, Neck, and Back Injuries"  
American College of Sports Medicine, New England Chapter  
Worcester, MA

- 11/04/87 "Low Back Pain"  
Nashoba Community Hospital Grand Rounds  
Ayer, MA
- 09/20/87 "When to Return to Contact Sports After a Head Injury"  
New Hampshire Medical Society  
Mt. Washington, NH
- 08/07/87 "When to Return to Contact Sports After a Cerebral Concussion"  
Community Health Lecture  
Emerson Hospital  
Concord, MA
- 08/03/87 "Comparison of Exercycle and Monark Bicycles: Maximal Oxygen Uptakes"  
Exercycle Corporation  
Newport, RI
- 07/28/87 "New Concepts in the Treatment of Spinal Injuries"  
Symmes Hospital Grand Rounds  
Arlington, MA
- 06/05/87 "When to Return to Contact Sports After a Cerebral Concussion"  
New England Neurosurgical Society  
Cambridge, MA
- 05/29/87 "On-Site Evaluation of Head and Spine Injuries"  
Clinical Workshop  
American College of Sports Medicine Annual Meeting  
Las Vegas, NV
- 05/29/87 "Acute and Chronic Brain Injury in Contact Sports:  
Historical Perspective and Overview"  
American College of Sports Medicine Annual Meeting  
Las Vegas, NV
- 05/29/87 "Acute and Chronic Brain Injury in Contact Sports"  
Symposium Chairman  
American College of Sports Medicine Annual Meeting  
Las Vegas, NV
- 05/08/87 "Role of the Neurosurgeon In Sports Medicine"  
Panel Chairman: Breakfast Seminar  
American Association of Neurological Surgeons  
Dallas, TX
- 05/01/98 When to Return to Contact Sports After a Cerebral Concussion  
Sports Medicine Update '87  
Westford, MA
- 04/24/87 "Extracranial Vascular Disease - The Carotid Endarterectomy Controversy"  
Primary Care in Stroke: Putting the Puzzle Together  
Westford, MA

- 04/06/87 "Brain Injuries In Football and Boxing - Can They be Prevented?"  
Hot Topics in Sports Medicine and Sports Science '87  
New York, NY -
- 02/27/87 "Medical Aspects of Boxing"  
American College of Sports Medicine Clinical Conference  
Keystone, CO
- 02/26/87 "Discogenic Disease - Surgical and Non-Surgical Approaches"  
American College of Sports Medicine Clinical Conference  
Keystone, CO
- 02/24/87 "Concussion - What Is It?: Guidelines for Returning to Sports"  
American College of Sports Medicine Clinical Conference  
Keystone, CO
- 02/23/87 "Acute and Chronic Brain Injury and Contact Sports"  
American College of Sports Medicine Clinical Conference  
Keystone, CO
- 01/08/87 "Guidelines for Return to Contact Sports After a Cerebral Concussion"  
International Symposium on the Prevention of Catastrophic Sport, and Recreational Injuries to the Spine and Head  
Toronto, Canada
- 01/07/87 "The Activities Leading to Head Injury"  
International Symposium on the Prevention of Catastrophic Sports and Recreational Injuries to the Spine and Head  
Toronto, Canada

## APPENDIX B

### TRIAL AND TESTIMONY LOG 2013

Deposition	Embry	January 2013
Trial	Embry	February 2013
Deposition	Giberson	March 2013
Deposition	Leach	April 2013
Trial	Potrawski	May 2013
Trial	Mattei	May 2013
Deposition	Saunders	June 2013

### TRIAL AND TESTIMONY LOG 2012

Deposition	Nasuti	February 2012
Deposition	Grane	February 2012
Deposition	Potrawski	February 2012
Deposition	Smith	March 2012
Trial	Carey	April 2012
Trial	Arbec	April 2012
Deposition	Giberson	April 2012
Deposition	Pondelicek	May 2012
Deposition	Rush	May 2012
Deposition	Ruiz	July 2012
Trial	Grane	August 2012
Deposition	Oshana	August 2012
Deposition	Council	August 2012
Deposition	Perez	September 2012
Deposition	Gault	September 2012

Deposition	Ward	October 2012
Deposition	Saunders	November 2012

**TRIAL AND TESTIMONY LOG 2011**

Trial	Robinson Case	January 2011
Deposition	Sloan Case	May 2011
Deposition	King Case	June 2011
Deposition	Schmitt Case	June 2011
Deposition	Carey Case	June 2011
Deposition	Grane Case	July 2011
Deposition	Rush Case	September 2011

**TRIAL AND TESTIMONY LOG 2010**

Deposition	Gebhardt	January 2010
Deposition	Simons	March 2010
Deposition	Arbec	April 2010
Deposition (2)	Rubalcava	May 2010
Deposition	Thibedeau	May 2010
Deposition	Utecht	August 2010
Deposition	Preece	November 2010

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## APPENDIX C

### DOCUMENTS CONSIDERED BY ROBERT C. CANTU, M.A., M.D., F.A.C.S., F.A.C.S.M.

#### A. Bates-Labeled Documents

NCAA00002866-67  
NCAA00002934-61  
NCAA00002962-80  
NCAA00003000-19  
NCAA00003351-59  
NCAA00003370-80  
NCAA00003381-94  
NCAA00003395-402  
NCAA00003403-11  
NCAA00003412-18  
NCAA00003419-26  
NCAA00003427-35  
NCAA00003436-44  
NCAA00003445-53  
NCAA00003454-63  
NCAA00003464-72  
NCAA00003473-81  
NCAA00007098  
NCAA00007144-47  
NCAA00007461  
NCAA00007513-16  
NCAA00007589  
NCAA00007642-47  
NCAA00007854  
NCAA00007855-71  
NCAA00007931-32  
NCAA00007936  
NCAA00007964-66  
NCAA00012568  
NCAA00012613-16  
NCAA00013976-99  
NCAA00014046-47  
NCAA00014606-09  
NCAA00014766-67  
NCAA00015153-54  
NCAA00016590  
NCAA00016592  
NCAA00016594  
NCAA00016641-45  
NCAA10022589-93  
NCAA10044661-62

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NCAA10055897

NCAA10056395

NCAA10056396-99

NCAA10068879-922

NCAA10089308

NCAA10101404-09

NCAA10107716-19

NCAA10139563

NCAA10139602-05

NCAA10140071

NCAA10140116-19

NCAA10140278

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ARRINGTON\_EIU200000245

ARRINGTON000002-3

ARRINGTON000084-86

ARRINGTON-BREMER0000045-46

ARRINGTON-EIU00000424

ARRINGTON-EIU00000431

ARRINGTON-EIU00000512-13

ARRINGTON-EIU00000655

ARRINGTON-EIU00000656

ARRINGTON-EIU00000657

ARRINGTON-EIU00000658

ARRINGTON-EIU00000673

ARRINGTON-EIU00000674-76

ARRINGTON-EIU00000684

ARRINGTON-EIU00000687

ARRINGTON-EIU00000688-89

ARRINGTON-EIU00000692-93

ARRINGTON-EIU00000694

ARRINGTON-EIU00000695-99

ARRINGTON-EIU00000700-01

ARRINGTON-EIU00000704

ARRINGTON-EIU00000707-08

ARRINGTON-EIU00000714-15

ARRINGTON-EIU00000838

ARRINGTON-EIU00000841

ARRINGTON-SBL0000111-12

IVY000120-123

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### DOCUMENTS CONSIDERED BY ROBERT C. CANTU, M.A., M.D., F.A.C.S., F.A.C.S.M.

OWENS\_CONWAY200000012

OWENS\_UCA200000017-19

OWENS000001-03

OWENS000004

OWENS000006-07

OWENS000008-10

OWENS000340

OWENS000739

OWENS003618

OWENS-JOHNSON0000002-4

OWENS-JOHNSON0000005

OWENS-MHC000022-23

OWENS-UCA000002

OWENS-UCA000007-08

OWENS-UCA000011-12

OWENS-UCA000040-41

OWENS-UCA000048-49

OWENS-UCA000050

OWENS-UCA000075

PALACIOS-ARCHER0000014-15

PALACIOS-ARCHER0000052

PALACIOS-KLESMIT0000002-5

PALACIOS-KLESMIT0000006-7

PALACIOS-KLESMIT0000008

PALACIOS-KLUCK0000010

PALACIOS-MANSFIELD0000034-35

PALACIOS-MANSFIELD0000036

PALACIOS-MANSFIELD0000037

PALACIOS-MANSFIELD0000047-59

PALACIOS-OBU0000042

PALACIOS-OBU0000043-47

PALACIOS-OBU0000058-61

PALACIOS-OBU0000072-76

PALACIOS-OBU0000087-90

SOLOMON000002-06

SOLOMON000007-09

SOLOMON000010-12

SOLOMON000013

SOLOMON000425

SOLOMON-LAWRENCE0000013

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SOLOMON-LAWRENCE0000071  
SOLOMON-UMAINE0000044-46  
SOLOMON-UMAINE0000105-11  
SOLOMON-UMAINE0000126-27  
SOLOMON-UMAINE0000128  
SOLOMON-UMAINE0000135-55  
SOLOMON-UMAINE0000166  
SOLOMON-UMAINE0000171  
SOLOMON-UMAINE0000176-78  
SOLOMON-UMAINE0000184  
SOLOMON-UMAINE0000262  
SOLOMON-UMAINE0000263  
SOLOMON-UMAINE0000264

#### B. Pleadings

Second Amended Complaint (Dkt. # 135)

Agreed Confidentiality Order (Dkt. # 57)

Plaintiff Angelica Palacios' Responses and Objections to Defendant National Collegiate Athletic Association's First Set of Interrogatories (Apr. 5, 2012).

Plaintiff Derek Owens' Responses and Objections to Defendant National Collegiate Athletic Association's First Set of Interrogatories (Apr. 5, 2012).

Plaintiff Kyle Solomon's Responses and Objections to Defendant National Collegiate Athletic Association's First Set of Interrogatories (Apr. 1, 2013).

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## APPENDIX C

### DOCUMENTS CONSIDERED BY ROBERT C. CANTU, M.A., M.D., F.A.C.S., F.A.C.S.M.

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Gary Miloces, *NFL Launches New Guidelines for Assessing Concussions*, USA TODAY (updated Mar. 30, 2011 4:50:36 PM), available at [http://usatoday30.usatoday.com/sports/football/nfl/2011-03-29-concussions-protocol\\_N.htm](http://usatoday30.usatoday.com/sports/football/nfl/2011-03-29-concussions-protocol_N.htm)

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#### E. Excerpts from Websites

NCAA Constitution, available at [www.ncaapublications.com](http://www.ncaapublications.com).

*Ron Courson Testimony at Congressional Forum*, THE NCAA NEWS (Feb. 23, 2010), available at [http://fs.ncaa.org/Docs/NCAANewsArchive/2010/aWide/ron\\_courson\\_testimony\\_at\\_congressional\\_forum.html](http://fs.ncaa.org/Docs/NCAANewsArchive/2010/aWide/ron_courson_testimony_at_congressional_forum.html).

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Impact, <http://www.impact.com>

What is King-Devick Test, <http://kingdevicktest.com/about/>

**ROBERT C. CANTU, MA, MD, FACS, FAANS, FICS, FACSM**  
**ALL CONCUSSION SIGNS/SYMPOTOMS CHECKLIST**

Patient Name: \_\_\_\_\_ Date: \_\_\_\_\_

	None	Mild	Moderate	Severe		None	Mild	Moderate	Severe
	0	1	2	3	4	5	6		
<b>Balance Issues</b>									
<b>Confusion</b>									
<b>Difficulty Concentrating</b>									
<b>Difficulty Remembering</b>									
<b>Dizziness</b>									
<b>Don't Feel Right/Dinged/Bell Rung</b>									
<b>Drowsy</b>									
<b>Fatigue/Low Energy</b>									
<b>Feeling In A Fog</b>									
<b>Feeling More Emotional</b>									
<b>Feeling Slowed Down</b>									
<b>Headache/Head Pressure</b>									
<b>Irritability</b>									
<b>Loss of Consciousness</b>	No Loc	<15 sec	15-30 sec	30-45 sec	45-60 sec	>60 sec			

The athlete should score themselves on the above symptoms based on how they feel today. (i.e. 0 = not present, 1-2 = mild, 3-4 = moderate, 5-6 = severe).

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**For Dr. Cantu's Use Only:**

Symptom Load \_\_\_\_\_ /26      Symptom Score\_\_\_\_\_ /156      Concussion Grade\_\_\_\_\_

**Concussion Patient History Intake Form**

Patient Name: \_\_\_\_\_

DATE: \_\_\_\_\_

Position Played: \_\_\_\_\_

Team: \_\_\_\_\_

**CONCUSSION HISTORY:**

		<b>Y</b>	<b>N</b>
	Have you ever been diagnosed with a concussion or had your "bell rung" or had symptoms in the check off list you completed after a hit?		
	Have you ever lost consciousness as a result of a head injury? How long		
	Have you ever been hospitalized as a result of a head injury? WHERE? DETAILS?		
	Have you ever had any imaging studies done of your brain? (CT, MRI, DTI, other?) NAME _____ DETAILS:		
	Date of most recent concussion		
	Date of most recent imaging studies		
	<b>ADDITIONAL RISK FACTORS: PERSONAL HISTORY</b>		
	Migraine Headaches		
	ADD/ADHD		
	Dyslexia		
	Other learning disabilities		
	Depression		
	Anxiety		
	Panic Attacks		
	Other Psychiatric Disorders		
	Seizure Disorder		
	Are you on any medications? If so List _____ _____		
<b>LIST FAMILY MEMBER</b>	<b>FAMILY HISTORY:</b>		
	Migraine Headaches		
	ADD/ADHD		
	Dyslexia		
	Other Learning Disabilities		
	Depression		
	Anxiety		
	Panic Attacks		
	Other Psychiatric Disorders		
	Seizure Disorder		

**ROBERT C. CANTU, MA, MD, FACS, FAANS, FICS, FACSM**  
**TODAY'S CONCUSSION SIGNS/SYMPOTMS CHECKLIST**

Patient Name: \_\_\_\_\_ Date: \_\_\_\_\_

Today's Date Date of Concussion	None	Mild	Moderate	Severe		
	0	1	2	3		
<b>Balance Issues</b>						
<b>Confusion</b>						
<b>Difficulty Concentrating</b>						
<b>Difficulty Remembering</b>						
<b>Dizziness</b>						
<b>Don't Feel Right/Dinged/Bell Rung</b>						
<b>Drowsy</b>						
<b>Fatigue/Low Energy</b>						
<b>Feeling In A Fog</b>						
<b>Feeling More Emotional</b>						
<b>Feeling Slowed Down</b>						
<b>Headache/Head Pressure</b>						
<b>Irritability</b>						
<b>Loss of Consciousness</b>	No Loc	<15 sec	15-30 sec	30-45 sec	45-60 sec	>60 sec

Today's Date Date of Concussion	None	Mild	Moderate	Severe
	0	1	2	3
<b>Nausea/Vomiting</b>				
<b>Neck Pain</b>				
<b>Nervous/Anxious</b>				
<b>Numbness/Tingling</b>				
<b>Ringing in the Ears</b>				
<b>Sadness</b>				
<b>Sensitivity to Light</b>				
<b>Sensitivity to Noise</b>				
<b>Sleeping Less than Usual</b>				
<b>Sleeping More than Usual</b>				
<b>Trouble Falling Asleep</b>				
<b>Visual Problems/Blurred Vision</b>				

The athlete should score themselves on the above symptoms based on how they feel today. (i.e. 0 = not present, 1-2 = mild, 3-4 = moderate, 5-6 = severe).

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For Dr. Cantu's Use Only:

Symptom Load \_\_\_\_\_ /26      Symptom Score \_\_\_\_\_ /156      Concussion Grade \_\_\_\_\_

**CERTIFICATE OF SERVICE**

The undersigned, an attorney, hereby certifies that on the July 19, 2013, a true and correct copy of the foregoing document was filed electronically by CM/ECF, which caused notice to be sent to all counsel of record.

/s/ Steve W. Berman

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